THE AEROPLANE and ASTRONAUTICS

DECEMBER 14, 1961

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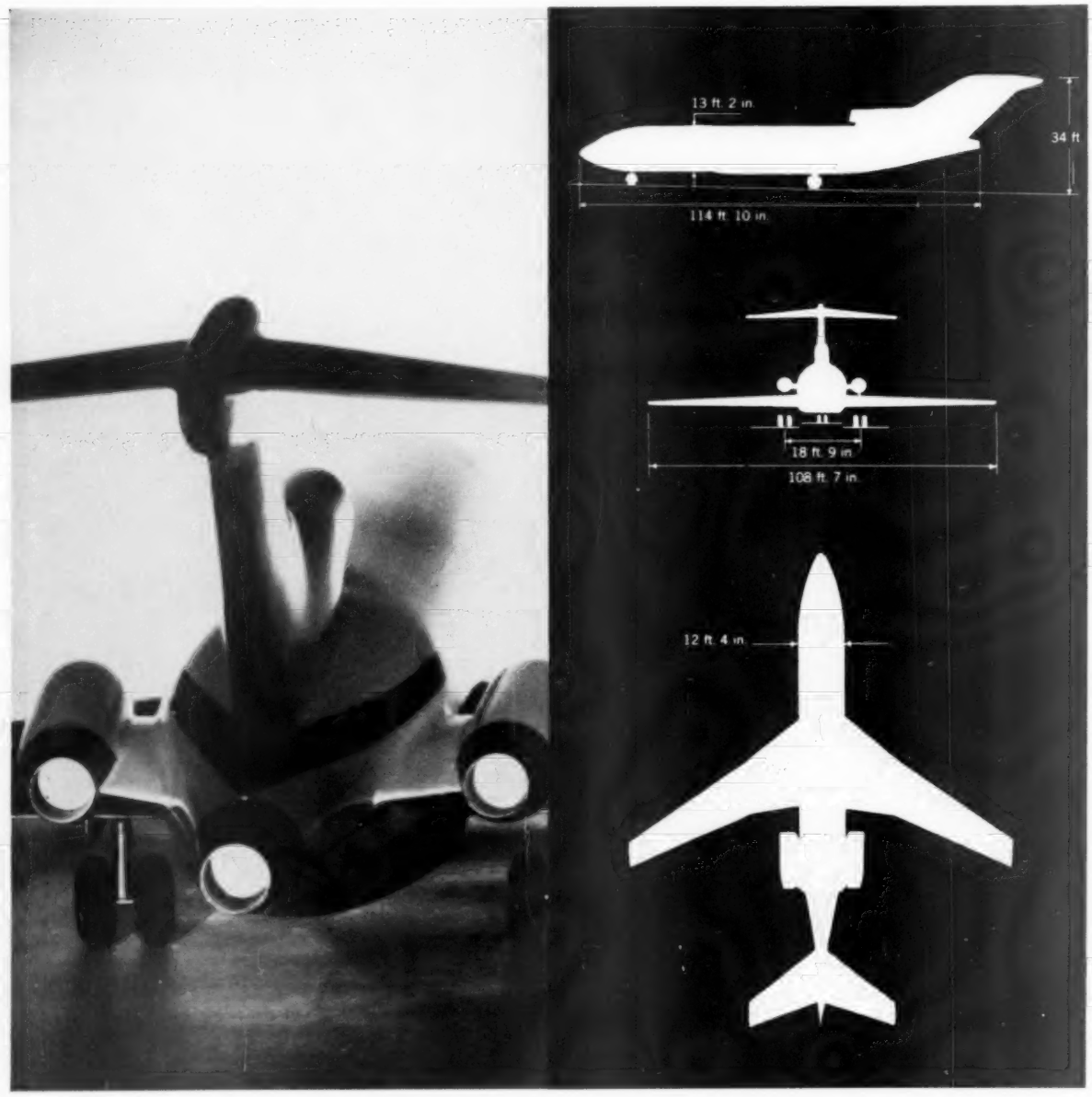
CHOOSES

THE SHORT HAUL JET

BAC | ONE-ELEVEN

TWO ROLLS-ROYCE SPEY TURBOFAN ENGINES

BRITISH AIRCRAFT CORPORATION



The Boeing 727: a versatile, short-haul profit-maker

The trim new Boeing 727, now entering production, is a versatile airliner designed to operate *profitably* over route segments ranging from 150 to 1700 miles.

The 727's low operating cost will enable it to produce a profit at short ranges, even with modest load factors. Yet its generous cabin space (70 first-class or 113 tourist passengers) results in seat-mile economy on high-density routes, comparable to that of the largest jetliners.

The 727 will be a rugged jet capable of handling frequent landings and takeoffs. A 7000-gallon fuel capacity, plus high allowable landing weights, will enable the 727 to make frequent stops over a long distance without refueling. This and other features, such as an integral passenger stairway, will minimize service time during stops.

The 727's quick takeoff, fast climb and near-600 mph speed will result in block speeds never before attainable in short-haul operations.

Already, 117 Boeing 727's have been ordered by American Airlines, Eastern Air Lines, Lufthansa German Airlines and United Air Lines for delivery beginning late in 1963.

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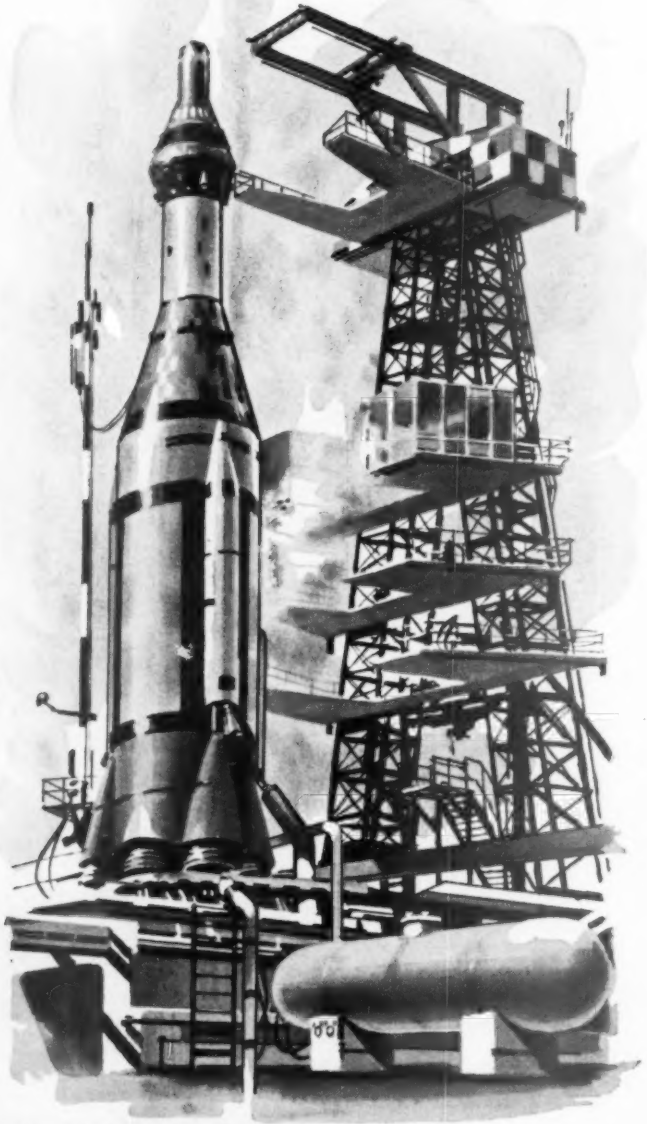

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The engine is the JT8D Designed and manufactured by Pratt & Whitney Aircraft, it uses two features from their proven family of engines. The JT8D inherits the basic technology of the JT3 and JT4 turbojets with more than 15 million hours of reliability. And from the turbofan engines powering the long-range Boeing and Douglas jetliners, the JT8D inherits the design for its forward fan. The JT8D will power the new 727 fleets ordered by Lufthansa, American Airlines, Eastern Air Lines and United Air Lines. Turning out 14,000 pounds of take-off thrust, with exceptionally low fuel consumption, the JT8D will help make it possible to operate from runways that used to be too short for modern jet travel.

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THE AEROPLANE and ASTRONAUTICS

VOLUME 101 NUMBER 2617 DECEMBER 14, 1961

Set Fair for Cargo-freighting

Lord Mountbatten's splendid oration at Mansion House, in London last week, at the Air League's annual luncheon, has been widely reported. We can be sure that the views of the Chief of Defence Staff, so explicitly expressed, will have been studied closely. It must be clear to all how much the future of this country and the future of those associated with it in the Commonwealth must depend on air transport.

It seems that in looking ahead it has become evident that however important the part ballistic missiles (presumably imported) are to play in the British deterrent rôle, such missiles must be fired from mobile launchers. These may be seaborne; they may be airborne. The possibility of launching ballistic missiles from large high-speed transports has been already discussed in our pages.

In his speech Lord Mountbatten also spoke of the need to ensure that the Army has full mobility by air. He had spoken of the serious thoughts which should be given to " those comparatively minor wars which can so easily burst into flame in the very shadow of the nuclear stalemate and, if not dealt with quickly, might escalate to a nuclear war." Flexibility in rôle and deployment, he said, had always been important characteristics of air forces. Only by achieving still greater flexibility would we be able to discharge our commitments with the forces which our economy could support. It was clear that the fighting elements of the Army together with their essential supporting services must be fully air-transportable and capable of fighting immediately upon landing.

Later during a discussion of the " difficult problem " of overseas bases, he said that whatever our plans for the future, we must have the strategic transport aircraft to match the challenge of fewer bases and increasing stage lengths. We all had reason to be thankful for the workaday efficiency of Transport Command. The R.A.F. order for VC10s would have been noted with satisfaction and when the Belfast came into service it would boost tremendously our freighting potential. Against the political future, however, there was no room for complacency about types or numbers.

He emphasized the importance of carrying worthwhile loads in relation to continually increasing speed. He expressed his views: " Thus the subsonic laminar-flow solution might well be preferable to a supersonic military transport. It would presumably be less expensive and more likely to have the flexibility of range and payload required. . . . "

Such requirements marry up well with the needs of commercial aviation. Nobody is going to pretend that the airlines are expecting an easy solution to their problems with the high-speed jets.

It is not surprising that there is increasing interest shown in building up the air freighting side of the business. Lord Mountbatten's words leave no doubt that military requirements also establish the need to develop large-capacity freight-carriers. Could it be that the economical low-speed freight-carrier so frequently advocated by Mr. Peter Masefield is about to come into its own?

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Matters of Moment

The Meagre Baggage Allowances

HOW many prospective air travellers are lost to the airlines annually because of the meagre free baggage allowances and the high charges for any weight in excess of the maximum?

No one can tell, but the figure is probably a high one on the long-haul and holiday services.

There must be many families who are making permanent moves over long distances and who would use air transport if it were not for the trouble involved in planning limited baggage requirements and in making arrangements for the bulk of their belongings to be moved by ship or by air freight. And there must be many holiday travellers who, thinking that the free airline baggage allowance is inadequate, just decide to go by train and boat.

The present baggage allowances are based on aircraft with the baggage/cargo capacities of an earlier era. Now that so many long-haul aircraft cargo holds are waiting to be filled the time is ripe for some new thinking by the airlines—some of whom might also find special excess baggage rates worth considering as a way of using some of the capacity which has been rendered useless by the turbojets.

Seaslug in Service

NEWS last week of the launching of the Royal Navy's fourth guided missile destroyer, H.M.S. "London," gave added emphasis to official statements that the Seaslug medium-range surface-to-air missile, with which ships of this class are to be armed, has now successfully completed acceptance trials and is ready for service with the Fleet. During these and other development trials—which have been accomplished aboard H.M.S. "Girdle Ness"—some 200 Seaslug rounds have been fired.

In the more recent acceptance tests, it is stated, 90% of the missiles fired either hit the targets or were within the acceptable "miss" distance from which proximity fuses would have ensured their destruction. It was said, too, that had the missiles been fired in salvoes, a 99% "kill" figure would have been achieved. In one particular series of tests all 16 rounds scored "kills."

The acceptance trials covered a wide variety of targets and both low- and high-altitude interceptions. For the last named, Canberra target drones were used "at great height" and, according to the Admiralty statement, on no occasion did the missiles fail to intercept.

Seaslug has been developed by a consortium comprising the Armstrong Whitworth Aircraft, G.E.C., Sperry Gyroscope and E.M.I. concerns. The complementary shipboard guidance radar was developed at the Admiralty Surface Weapons Establishment at Portsdown. At a Press conference following the return of "Girdle Ness" from the Mediterranean where the acceptance trials were carried out, it was disclosed that NATO representatives had been allowed to watch the firings and were most impressed. So far as the weapon's vulnerability to countermeasures by target aircraft—it is a beam rider—is concerned, it was said that Seaslug was "a very difficult weapon to fool."

Europe and Space Research

HOPES that the European Space Research Organization (ESRO) might be a going concern by the spring of next year were expressed during a symposium of space research organized by the Royal Astronomical Society on Dec. 8. Sir Harrie Massey, chairman of the Preparatory Commission of ESRO, described the proposals that had been put forward for a wide range of scientific experiments extending from research with modest instrumented satellites orbiting the Earth to stabilized space vehicles capable of mounting small astronomical telescopes. He thought it possible that within eight years Europe could develop a small unmanned space observatory to orbit the Moon.

ESRO, he emphasized, would not manufacture the rocket boosters. These could be acquired from the most suitable available source, either from the projected European Launcher Development Organization or from the United States.

Speaking on the "Facilities for British Space Research," Mr. S. F. Follett of the R.A.E. gave an interesting outline of the opportunities available with British and European rocket vehicles. The Skylark sounding rocket, first launched at Woomera on Feb. 13, 1957, had now been developed with an R.P.D.-developed Cuckoo booster and could now reach altitudes above 130 miles. An air-jet automatic stabilization system was being developed to stabilize the instrument head. Certain equipment could be parachuted down and recovered at 25 ft./sec.

Photograph copyright "The Aeroplane and Astronautics"

PRESENTATION AT CHELSEA.—Rear Admiral Sir Matthew Slattery, chairman of B.O.A.C. and president of the Chelsea College of Aeronautical and Automobile Engineering, presents the Olley Challenge Trophy to Mr. N. E. Wright at the College's annual Awards Day, on Dec. 6. On Sir Matthew's right is the College Principal, Mr. J. A. C. Williams.

Of Black Knight, there had been 11 "almost completely successful" firings; this vehicle could project 200 lb. to an altitude of 100 miles. On the subject of the proposed European heavy satellite launcher based on Blue Streak, a French second stage and a third stage produced under German management, Mr. Follett disclosed that the third stage would use unsymmetrical dimethyl hydrazine (UDMH) and nitrogen tetroxide, the same propellents as the French second stage. The higher specific impulse obtainable with this combination will permit "slightly improved payloads" as compared with the R.A.E. scheme for a third stage based on H.T.P./kerosene.

Prof. Z. Kopal, of Manchester University, considered that while Russia and the United States were spending a great deal of their energy in sending men to the Moon, European countries could "stake a claim on some of the serious scientific research which needs to be carried out in the Solar System." He thought that particular attention might be paid to the measurement of infra-red radiation of the planets. It might also be possible, he said, to deduce a good deal about the surface composition of the Moon by studying, with the aid of a Moon satellite, the interaction of X-rays ejected from the Sun with the lunar surface.

Air Matters in Parliament

Reorganization and Redundancy

Actual and imminent redundancies in the aircraft industry consequent upon manufacturing realignment prompted MR. G. R. CHETWYND (Lab., Stockton-on-Tees) to ask the Minister of Aviation at question time in the House of Commons on Dec. 4 what remedial action he was taking in the way of suitable Government orders for civil and military aircraft.

MR. PETER THORNEYCROFT stated in reply that with Government spending on aircraft production now running at a rate of well over £200m. a year any redundancy must be regarded as a natural consequence of reorganization and rationalization within the industry to meet the resulting pressure of demand. As to future work, he said, he had already reaffirmed the pledges to the industry given by his predecessor, and was in urgent consultation with the relevant Government Departments on the complex problems involved. He was discussing with the industry certain ideas to avoid undue hardship in the process of remodelling, but he had to emphasize that it was to the pattern in three or four years' time that we had to look, rather than to any shape of the industry as it was today.

Questioned further by MR. J. DIAMOND (Lab., Gloucester), the Minister added that he was in constant touch with the Ministry of Labour and the Board of Trade and that he was advised that closure of factories recently announced was unlikely to result in any serious or persistent unemployment. "We must try to get this matter in perspective," he declared. "Employment in the aircraft industry is going up, not down. The fact that in reorganization some factories are closed while work is concentrated on others is not a disaster. It should be plain common sense."—O. W. H. COOKE.

The Trident's First Flight

AS the tension inseparable from a first flight heightens at Hatfield so does World interest in the Trident. This new de Havilland 600 m.p.h. medium-capacity short-haul air liner is not only the first three-jet design in its category to be rolled out but its makers are confident that it will be the first in service.

For reasons of commercial security, little has so far been released about the design or deliveries. What has been said is that B.E.A., who have ordered two dozen and have an option on more, will be running services before the end of 1963. B.E.A., with their conservative approach, are not likely to contemplate such action unless they had good reason to believe that they would have aircraft in their hands for initial proving much earlier than that.

Thus the de Havilland statement that deliveries will start in 1963 is also certain to be conservative. Exactly how conservative is a matter of very special interest since deliveries of the Boeing 727, on which work began a year ago, are promised before the end of 1963 and one airline is aiming to start services with this American contender in that year.

The Trident 1, the variant bought by B.E.A., will carry 77 passengers (18 first class and 59 economy class) or, as an alternative, 101 economy class in a cabin able to seat six abreast. In addition, a ton of freight and fuel for stages of nearly 1,000 miles bring the all-up weight to 107,000 lb. The max. cruising speed is 606 m.p.h. (967 km/hr.) and that for best economy 585 m.p.h. (941 km/hr.).

Selection of these speeds was influenced by the need to provide the lowest possible operating cost per aircraft-mile and per seat-mile. As a result, operators of the Trident will be in a position to offer passengers the lowest possible fare (subject to IATA agreements) commensurate with accepted standards of speed and comfort. Since 60% of all seat-miles have been shown to be sold for stages of not more than 1,000 miles in length, the Trident is specifically designed to satisfy a large proportion of the World's airline requirements.

The date of the first flight and the speed with which the subsequent trials are carried out are clearly going to be a major factor in the sales competition between the Trident and its U.S. competitor.

A Premature ELDO Report

A REPORT on December 11 suggesting that seven Governments have formally agreed to support the projected European Launcher Development Organization (ELDO) has been denied by the Ministry of Aviation. Earlier this week, however, meetings were taking place, in London, of the informal working group set up to make arrangements for the work of the Organization *pending* Government's decisions.

More Comets for U.A.A.

THE order for two more Comet 4Cs for United Arab Airlines—already announced by the carrier (see our issue of Nov. 30, p. 691)—was duly signed last week-end. They are to be delivered in April, 1962, increasing U.A.A.'s Comet fleet to seven.

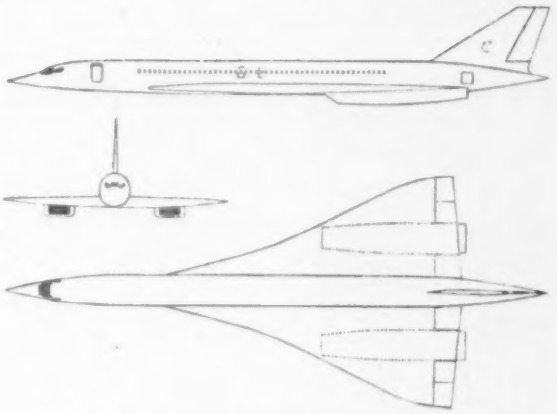
Since U.A.A. introduced the Comet on July 16, 1960, the operator's share of traffic between Egypt and European centres has increased from 19% in 1959, to 32% in the first half of 1961 and to 43% in the third quarter of this year. Load factors have averaged more than 50%.

With the present five Comets, utilization is running at about 2,500 hr. per annum per aircraft and it is hoped that the figure will rise to 3,000 hr. U.A.A. has stated that aircraft and engine serviceability is now averaging 99.3%.

The operator's turbojet network has been steadily increased with services to Accra, Ghana, in 1960; to Moscow last summer; and to Karachi and Bombay on Nov. 1. A service to Tokyo is planned for 1962 and a bilateral agreement between the two countries has already been signed (see last week's issue, p. 716).

A total of 66 Comet 4s, 4Bs and 4Cs have now been sold, including five for R.A.F. Transport Command, and 57 have been delivered. Other sales are being negotiated.

One of U.A.A.'s Comet 4Cs.



SUPER CARAVELLE.—An official three-view of the 100-seat Sud supersonic transport, which is to fly in 1965. It will weigh 198,500 lb. and have a range of 2,400 naut. miles at Mach 2.2.

The Lords Debate Space Research

A LENGTHY debate in the House of Lords on Dec. 6 produced some lively discussion on the merits and demerits of Europe in general, and Britain in particular, "going into space." The Motion was introduced by the Earl of Bessborough who drew attention to the disparity which existed between the emphasis which was being placed on space development in Russia and America and that which was being placed on this activity by the British Government.

In a long and eloquent speech, urging the Government to take a more active part in this field, he disclosed that he had "just received the exciting news that my colleague, Mr. Geoffrey Pardoe, who is Chairman of the Technical Committee of the British Space Development Company, and I have been invited by the head of the Society Academy of Sciences to visit the Soviet Union to meet their own space specialists."

Lord Waleran introduced another aspect of the space problem. He hoped Her Majesty's Government would recognize and give full weight to the military aspect, as he did not believe this could be solely achieved as a by-product of ELDO. He went on: "I believe it demands the attention of a Services Ministry and the support of a research programme directed to military ends; and I suggest that the Royal Air Force would seem the Service best fitted by rôle and technological experience to be charged with this responsibility."

Answering for the Government, Viscount Hailsham, Minister for Science, outlined the various programmes in which the United Kingdom was at present involved, including work with Skylark, Black Knight, Blue Streak (and ELDO), the U.K./U.S. S-51 research satellite and the European Space Research Organization. He also mentioned the satellite communication experiments which were to be carried out by the G.P.O. in association with NASA.

Of more ambitious enterprises, he said: "Unless we develop Blue Streak—I say Blue Streak specifically—either co-operatively or on our own, there will be virtually no advanced rocket

Matters of Moment . . . .

technology either on this side of the Atlantic or on this side of the Iron Curtain. . . . These are questions which I think all European countries, and not merely ourselves, should ponder when they consider, as they are doing now, the future of Blue Streak.

"I must, however, emphasize that in no circumstances that I am aware of will Blue Streak fly a man into space. This would require a payload of something like four tons, and a much bigger rocket than Blue Streak would be required. I do not know how much it would cost to develop one; but if I were to say that it would be something of the order of £1,000m. I do not think I should be far out."

With this last point rocket engineers may be prepared to argue—especially the Americans who are poised in an attempt to orbit their first astronaut for a payload in the neighbourhood of two tons. With a "high energy" stage on Blue Streak, Europe could—if it wished—do the same or better.—K.W.G.

R.A.F. Tactical Missile Procurement

REPORTS last week in the daily Press that the R.A.F. has decided to order the Nord AS-30 air-to-surface missile appear to be premature, since they were denied by the Air Ministry. There seems no doubt, however, that either the AS-30 or the Martin Bullpup (described in our issue of Dec. 7) must be selected for British procurement, as there is no corresponding weapon under development in our current missiles programme.

Bullpup will almost certainly go to the Royal Navy, in the interests of standardization within the Atlantic Fleet, apart from stowage considerations of the AS-30, which breaks into rather larger components. The AS-30 is already in operational service with the French Air Force, mounted on Vautours, and is intended for the Mirage III and the Etendard IV. It is currently being evaluated with the Fiat G.91, and was also launched during development from Canberras of the French Air Force, so that it has proved its compatibility with the type from which it would be used by the R.A.F.

AS-30 weighs just over 500 kg. (1,100 lb.), which compares with 571 lb. for Bullpup A and about 1,400 lb. for Bullpup B. Range in each case is about eight miles, although for optimum accuracy the effective distance may be rather less. There is little difference in dimensions and probably in price, although only that of the AS-30 has been quoted, as around £5,000 per missile.

Factors that may decide the final choice may therefore hinge on such items as (in favour of Bullpup), standardization between the Navy and the R.A.F.; and (for AS-30) the desirability of buying more from France to improve the rather one-sided technical sales exchange between the two countries. Another point in favour of the AS-30 is that it comes from a French family of weapons already on order for the British Services for anti-tank and other duties, and the smaller types in this family may be used as low-cost trainers for aircraft release. The AS-30 is virtually a scaled-up AS-20, which in turn was derived from the smaller SS-10, SS-11 and AS-11.

A possible drawback to AS-30 procurement is that no mention has yet been made of a French equivalent to the Martin GAM-83B, which is the nuclear-armed member of the Bullpup family.

Beech's New Musketeer

FURTHER details have been released of Beech's new low-cost ($12,000 f.a.f.) four-seater, the Model 23 Musketeer, which we illustrated in our issue of Dec. 7. Unveiled at the recent annual meeting of Beech international distributors, the Musketeer prototype N948B is in the advanced phase of its factory flight test programme and is continuing for F.A.A. certification. First production deliveries are scheduled for the autumn of 1962.

Aimed at the business flying market, the Musketeer is a completely new Beech design, although bearing a family resemblance to the larger low-wing four-seaters. It is closely comparable in size and performance with the contemporary Piper Cherokee, and is similarly powered by a 160-b.h.p. Lycoming O-360-A1A engine. First flight of the prototype was made on Oct. 23.

Like all Beech aircraft, the Musketeer is built to unusually high strength factors, with an ultimate of 6.6 *g*. Its design includes an all-moving slab tailplane, for more effective control from a smaller and lighter surface, and a fixed wide-track nosewheel undercarriage utilizing rubber-in-compression shock absorption and hydraulic brakes. Standard price of the Musketeer will include many items normally listed as optional equipment, including a Beechcraft nav/com radio package.

Empty weight is 1,265 lb., and max. gross, 2,300 lb., including 33 Imp. gal. fuel. Span is 33 ft., length 24 ft. 2 in., and wing area 145 sq. ft. Cruising speed at 75% power and 7,000 ft. is 138 m.p.h. The Musketeer will be licensed in the Normal Category at 2,300 lb., and in the Utility Category at 1,950 lb. At the latter weight it will be cleared for spinning.

Jane's for 1962

PUBLISHED yesterday, the 1961/62 edition of "Jane's All the World's Aircraft" provides a unique record of current aeroplanes. Its editor, John W. R. Taylor, has continued his policy, begun last year, of collecting information and illustrations from every available source, and has not relied solely on manufacturers' hand-outs. In consequence, this volume illustrates some little-known rarities.

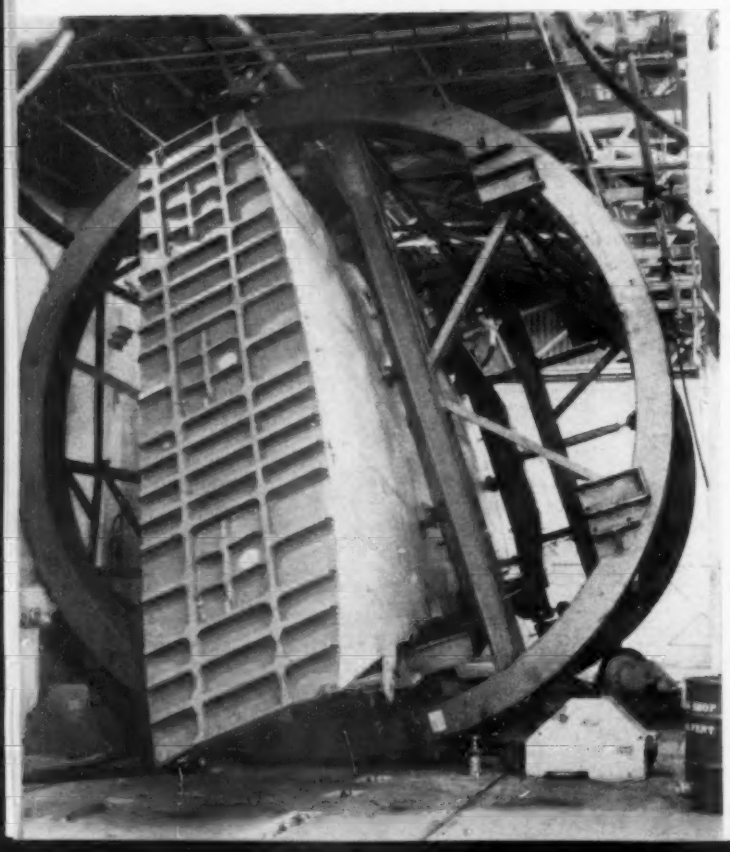
Necessarily, this policy has tended to change the appearance of the volume somewhat, with a higher proportion than hitherto of small photographs, a few of rather poor quality and accompanied by the minimum of data. The value of the work for reference purposes is enhanced, however, and the small reduction in the size and number of pictures of some of the better-known aircraft is more than justified.

Rationalization of the British industry has led to some changes, including the grouping of all the companies of the British Aircraft Corporation in one place. There has been some rationalization of the contents of Jane's, too, with British aircraft now appearing under the "U.K." heading, and the British Commonwealth countries treated individually. Russia now appears as the U.S.S.R., so that the pages dealing with the three major aircraft-producing countries—U.K., U.S.A. and U.S.S.R.—are in juxtaposition.

The section on Russian aircraft provides the most complete record of the newest information so far to appear, with illustrations of the important new aircraft displayed over Moscow last July, and a list of their official code-names, most of which have not previously been published.

In addition to the main part of the work describing aircraft, separate sections deal with engines (piston and gas turbine types are no longer separated), missiles, drones and pilotless aircraft, airships and ground effect machines (a 10-page survey).

"Jane's All the World's Aircraft, 1961/62" contains 522 text pages plus a 20-page introduction and index. There are 959 half-tone illustrations, of which 531 are new this year, and many three-view line drawings. The work is published by Sampson Low, Marston and Co., Ltd., price £5 5s. net.—F.G.S.



ENSURING FUEL TIGHTNESS.—We recorded last week that the prototype VC10's main wings were undergoing a "slushing" process with fuel-tank sealant. This photograph shows a VC10 wing installed in the special rig used for this operation.

Aviation News in General

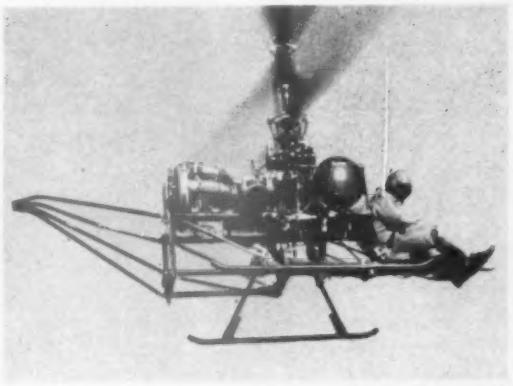
AERO-ENGINE EXPORTS.—During the first 10 months of this year Britain's aero-engine exports reached £70.5 million, only £3.2 million less than 1960's record total of £73.7 million. Thus it is almost certain that the final total for 1961 will show that the year's aero-engine exports have achieved a new record.

INDIAN 748 NEWS.—At Kanpur on Nov. 26 the first Indian-built Avro 748 was christened with the type name "Subroto" after the late Air Marshal Subroto Mukerjee, formerly C.A.S. of the Indian Air Force. Those present at the ceremony, which also marked the official first flight (it actually first flew on Nov. 1), included the Prime Minister, Mr. Nehru, Mr. Krishna Menon, Minister of Defence, and Dr. P. Subbarayan, Minister of Transport and Communications.

PARA CARRIER.—Paratroop trials from the A.W. Argosy C.1 at the A. and A.E.E., Boscombe Down, have revealed that the aircraft is an excellent jumping platform, says Hawker Siddeley. First to make a "live" drop after tests with dummies were Flt. Lt. B. W. Rigold and Flt. Sgt. B. Lambirth, both of the Airborne Forces (R.A.F.), Boscombe Down.

MERGER VALID.—The merger of Chance Vought with Ling-Temco Electronics has been upheld as legal in a U.S. District Court action, despite Federal government efforts to break it because of alleged reduced competition in the industry.

SUSTAINED ALTITUDE RECORD.—A record in the little used F.A.I. category for sustained altitude has been claimed for the F4H-1 Phantom II at 66,443.3 ft. The requirement is for a 15/25 km. course to be flown without loss of speed or altitude.



DEADLY DRONE.—First released photograph of the Gyrodyne DSN-3 drone anti-submarine helicopter—seen here with safety pilot aboard—which has been flying since last April. Powered by a 270-s.h.p. Boeing T50-BO-4 turbine, it is designed to carry homing torpedoes and operate from the deck of a destroyer.

test pilot of Avions Fairey, at the controls. At an official ceremony at the SABCA-Fairey plant at Gosselies on Dec. 4 the aircraft was demonstrated before dignitaries and officials with Neefs performing rolls and high-speed passes beneath a 500-ft. cloud base.

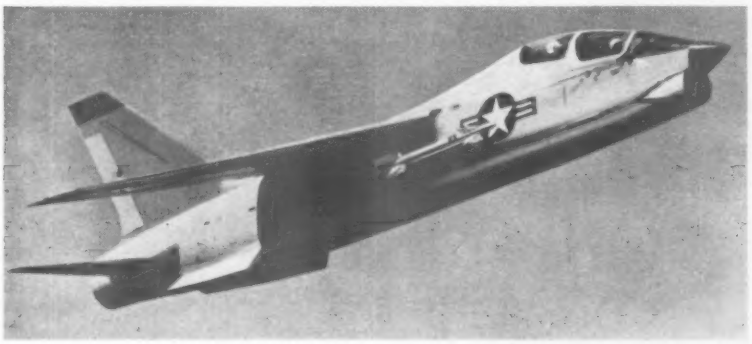
MORE VINTOKRYL RECORDS.—New World payload-to-height records are claimed for the Kamov Vintokryl convertiplane which on Nov. 24 reached 2,557 m. (8,389 ft.) with a 16,485-kg. (36,343-lb.) payload. The records are in the one-, two-, five-, 10- and 15-ton categories together with that for lifting maximum load to more than 2,000 m. Further height and speed record attempts are planned for the near future.

LOCKHEED VZ-10.—The designation VZ-10 has been allocated to the Lockheed Model 330 Humming Bird in the U.S. Army category for research convertiplanes. Two are being built, to fly next year.

CODE NAMES.—Among the code names approved by NATO to identify the newest Russian aeroplanes are the following: *Coke*, Antonov An-24; *Cub*, Antonov An-12; *Mail*, Beriev turboprop flying-boat; *Mallow*, Beriev M-10 turbojet flying-boat; *Harp*, Kamov turbine-powered anti-submarine helicopter; *Flipper*, Mikoyan (?) twin-jet delta-wing interceptor; *Hip*, Mil V-8 helicopter; *Harke*, Mil flying crane; *Mantis*, Yak 32; *Firebar*, Yak-25 (supersonic variant).

CONGO BOMBS.—Under U.N. pressure, Britain has approved the supply of GP high-explosive bombs for the Indian Air Force Canberra B.(I)58s engaged in operations against Katangan military forces in the break-away province. The bombs are being limited to either 24 x 1,000 lb. or 48 x 500 lb., and are specified for use only against grounded aircraft of the Katanga Air Force or similar targets.

R.A.F. IN SPACE?—It is understood that the Air Council is demanding that funds should be made available at the earliest opportunity for the development of military satellites for communications and reconnaissance. Air-launching techniques have been considered. Official approval, which would give the R.A.F. a positive rôle in space, may be withheld only so long as the present economic situation lasts.



CRUSADER FOR TWO.—A trainer version of the Chance Vought F8U-1 Crusader—the F8U-1T—is scheduled to fly in February. Depicted in this airbrushed photograph, it has a 15-in. higher canopy than the operational aircraft, provision for two 20-mm. cannon and two Sidewinder AAMs and a braking 'chute. Maximum speed will be Mach 1.5.

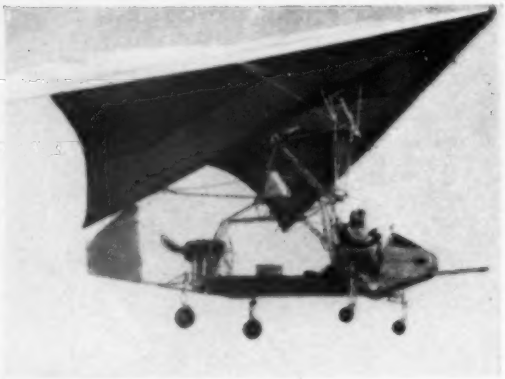
SUBSIDIARY SALE.—Flight Refuelling Inc., of Baltimore, a company started in 1948 by Flight Refuelling, Ltd., to manufacture equipment for the U.S.A.F. and U.S. Navy, has become a wholly owned subsidiary of the Aeronca Manufacturing Corporation. It is to be operated as part of Aeronca's aerospace division.

BELGIUM'S FIRST STARFIGHTER.—The first Belgian-assembled F-104G flew on Dec. 1 with Bernard Neefs, chief

RECORD CLAIMS.—Three new World helicopter speed records are claimed by the U.S. Navy for a Sikorsky HSS-2 which on Dec. 1 averaged 182.8 m.p.h. over 100 km. (62 miles); 179.5 m.p.h. over 500 km. (311 miles); and 175.3 over 1,000 km. (623 miles). The HSS-2 also holds the 3 km. speed record when last spring it averaged 192.9 m.p.h. The fifth World helicopter speed record, without altitude limitation, is held by a Mil Mi-6 which averaged 198.8 m.p.h.

U.K./U.S. SATELLITE. — Viscount Hailsham, Minister for Science, told the House of Lords on Nov. 6 that the first scientific satellite jointly developed by the U.K. and the U.S.A. would be launched by a Thor-Delta from Cape Canaveral "next spring." The British contribution was being financed by D.S.I.R. at an annual rate of £160,000. Identifiable Government expenditure on scientific space research amounted to about £550,000 a year. "This will increase perhaps to more than tenfold over the next 10 years. Britain is not in a position to ignore space research."

48TH SKYLARK.—A two-stage Skylark sounding rocket instrumented by London, Birmingham and Leicester Universities was launched to an altitude of 144 miles from Woomera on Dec. 6. The 33-ft.-long rocket, weighing nearly 3,500 lb., was the 48th Skylark to be fired from Woomera; it carried instruments to examine the effects of the upper atmosphere on radio transmissions. Seventeen Skylarks have been launched this year.



FLEXIBLE FLIGHT.—A new photograph of the Ryan Flex-Wing. The aircraft has recently completed its initial powered-flight trials at San Diego. Further trials will be made by NASA at Langley Field.

PROJECT ROVER.—A static test stand for the Nerva nuclear rocket engine is to be built by the Aetron Division of Aerojet-General Corporation at an estimated cost of $8m. The downward-firing facility is the second engine stand planned for erection in the Rover test area at Jackass Flats, Nevada. The Nerva liquid hydrogen nuclear engine, being developed by Aerojet-General and Westinghouse Electric Corp., is a flight-weight prototype for the Rover programme.

JET COMMANDER SALES.—Aero Commander Inc. is advertising Jet Commanders for sale now with delivery in the third quarter of 1963. Deliveries are guaranteed, deposits will gain interest and are returnable if delivery is not made as specified, performance is guaranteed and a 12-month warranty is offered.

Commercial Aviation Affairs

VC10s REGISTERED. — The 15 Vickers VC10s for B.O.A.C. will bear the registration letters G-ARVA to G-ARVC and G-ARVE to G-ARVP inclusive. The Vickers-owned prototype is G-ARTA.

DART OVERHAULS.—West Coast Airlines, of Seattle, has become the first F-27 operator to obtain approval for 3,000-hour inter-overhaul periods for its Dart 511 engines.

AVRO 748 SERIES 2.—The second prototype Avro 748 (G-ARAY) has now been re-engined with Dart 531s (R.Da.7) and has been flying as the prototype Series 2 for several weeks.

ABBOTSINCH APPROACHES. — Obstacles on the approach path to Abbotsinch may delay adoption of the airport in place of Renfrew to serve Glasgow, as planned for mid-1963. The obstacles include some cranes recently installed at Rothesay Dock on Clydeside, with a height of 150 ft. The Ministry of Aviation has informed the Clyde Navigation Trust that the maximum height limitation on ground buildings at Rothesay will be 140 ft.

TU-124 FOR EXPORT.—According to our French contemporary *Les Ailes*, delivery of 68-seat Tupolev Tu-124 short-haul jetliners to East European countries is imminent. C.S.A. will have eight, Malev, four, Tarom, six, and LOT an unspecified quantity.

ROTTERDAM SERVICE. — A scheduled twice-weekly service between Liverpool and Rotterdam by way of Newcastle, Cardiff and Bristol, is to be started next month by Dan-Air Services.

SILVER CITY VISCOUNTS.—We have been asked to point out that, contrary to information previously given to this paper, the three Viscounts to be used by Silver City have been leased direct from Maitland Drewery. The earlier lease of these same aircraft to B.K.S. Air Charter had been handled by Keegan Aviation.

CARAVELLE UTILIZATION.—Four Air France Caravelles based in Algiers for use on the route to Paris achieved a total utilization of nearly 10,000 hr. in the year ended Oct. 31. Maximum daily utilization was 7 hr. 35 min., achieved in September, 1961. During October the average Air France Caravelle utilization was 5 hr. 56 min. Highest utilization recorded was 9 hr. 2 min. by a Swissair Caravelle.

DOMESTICATED TIGERS.—Canadair CL-44s have begun domestic freight service with The Flying Tiger Line and have already carried a record 63,708 lb. payload from Detroit to Burbank, on a flight starting at Newark. In MATS work between Burbank and Tokyo, CL-44s are giving 80% regularity and around 10 hours' daily utilization.

VISCOUNT OBJECTION. — Efforts have been made in the U.S. to block the sale of Viscounts to Communist China. A House of Representatives committee was told by the Asst. Sec. of Commerce that America "tried very hard" to stop the sale, which was reported in our previous issue.

GHANA TO MOSCOW. — Using Ilyushin Il-18s, Ghana Airways is to open a service from Accra to Moscow on Dec. 19, with a frequency of one flight a fortnight. The service will operate by way of Bamako, Tunis, Zurich and Prague in a flying time of 17 hr.

IRISH CARAVELLES?—Purchase of jet aircraft for service on Aer Lingus routes in 1963 is reported to be imminent. The Caravelle is tipped as the likeliest choice; also considered by Aer Lingus have been the Trident, One-Eleven, Boeing 727 and Fokker F-28.

AIR INTER EQUIPMENT. — Five Viscount 708s will be acquired by Air Inter from Air France as a first step in establishing the company's own fleet (see page 757 of this issue).

PIEDMONT PURCHASE.—A fleet of 17 Martin 404s is to be purchased by Piedmont Aviation from T.W.A. Including spares, tools and equipment, the deal costs $6,450,000. Piedmont will sell most of its 17 DC-3s; also in service with the airline are eight F-27s.

DERBY AVIATION.—The withdrawal of two applications for inclusive tour services by Derby Aviation, mentioned in our previous issue (p. 716), does not reflect any financial difficulties, but was a result of replanning of the company's routes. Derby Aviation's fleet now comprises seven Dakotas and three Argonauts.

A.T.L.B. Decisions and Applications

(Scheduled Services Only)

Licences Varied

A457/1. B.O.A.C. To introduce a traffic stop at El Adem on the route London-Tripoli/Benghazi for the period Dec. 1, 1961-Jan. 31, 1962, for one service only in each direction.

A152/1. Derby Aviation. To introduce Cambridge and delete Nottingham as traffic stops on the route Derby-Nottingham - Birmingham - Luton - Ostend. No traffic rights between U.K. points. Application to use DC-4/Argonauts refused.

A160/1. Derby Aviation. To introduce an optional traffic stop at Birmingham on the route Derby-Luxembourg. No traffic rights between U.K. points. One Argonaut can be used in place of two DC-3 services.

Licences Revoked

A1000. Cunard Eagle Airways. London-New York.

A15/2. Air Safaris. Bournemouth - Dublin/Belfast.

A16/1. Air Safaris. Bournemouth - Ostend - Amsterdam.

Applications

None.

Applications Withdrawn

A1033. B.U.A. London - Kano - Leopoldville/Elizabethville/Usumbura - Johannesburg.

B.E.A. TO APPEAL.—Appeals will be lodged by B.E.A. against certain of the A.T.L.B. decisions to license independent operators on European routes. Details of the appeals are not yet available.

AIR SAFARIS PETITION.—A petition for the compulsory winding-up of Air Safaris, presented by Alkit, was adjourned for two weeks on Dec. 4. Five creditors, including Alkit, were said to be owed a total of £3,450. Esso Petroleum, said to be creditors for £103,000, opposed the winding-up petition.

PHASING-OUT NAVIGATORS. — Following the introduction of Doppler-Loran on its transatlantic operations, T.W.A. will cease to carry navigators and has concluded an agreement with the Air Line Navigator's Association (Local 520) concerning the 55 crew members involved. The agreement follows the recommendations of the Presidential Fact Finding Commission which provided for severance pay up to $25,000, and a phase-out programme of 36 months.

(*Continued on page 769*)

Air Transport

A Deficit for Both Corporations?

TWO days after Sir Basil Smallpeice had stated that B.O.A.C's deficit for the first 32 weeks of the financial year was £7,701,000 after interest payments, Mr. A. H. Milward said that it was now unlikely that B.E.A. would be able to "keep out of the red" in 1961-62.

Previously (see our issue of Nov. 30, p. 692) the Minister of Aviation had said that B.E.A. hoped to break even this year. Mr. Milward's comment was made after the start of the electrician's dispute, which had, during last week-end, already caused the cancellation of 27 of the Corporation's services out of Heathrow. According to Mr. Milward the Ministry of Aviation loaders' strike had cost the Corporation an estimated £250,000 and the new dispute was, he said, bound to make things worse. "Like most other airlines," he added, "we are having a difficult enough time without labour disputes."

Sir Basil, writing in the *B.O.A.C. News*, said that up to Nov. 11 (32 weeks after the start of the financial year) B.O.A.C.'s results were just about £8.25 million below the budgeted figure. Expenditure had remained firmly under control and had not exceeded the budgeted amount. A number of cost savings, amounting to about £500,000, had been achieved, but economies were not made quickly while maintaining a planned series of services.

B.O.A.C., he said, had lost £2.5 million or more during the strikes in June and July. The actual revenue lost was about £1.75 million and the remainder was the result of cancelled bookings. The revenue since April had been £6.25 million below budget—the greatest part of the shortfall being on the North Atlantic. The World-wide load factor was 52%, by comparison with a budgeted 58.5%. In a full year 1% of increased payload was equivalent to about £1.5 million in revenue.

Poland's Atlantic Aspirations

POLISH AIRLINES LOT is eager to operate a transatlantic service, not only for prestige but for good commercial reasons also. Discussions have been held with B.O.A.C. on possible collaboration for this operation. Mr. Jan Krzywicki, president of LOT, speaking of his airline's plans in New York last week, said there were more than six million persons of Polish origin in the U.S. and Canada. Last year there were more than 20,000 visitors from North America to Poland, and 10,000 visitors and emigrants from Poland to North America.

An exchange of traffic rights between Poland and the U.S.A. was tentatively discussed by Mr. Krzywicki in Washington, but there are no immediate plans for a formal approach from the Polish Government. B.O.A.C. confirmed last week that an approach had been made by LOT to discuss methods of co-operation, but no conclusions had yet been reached.

LOT is reported to be shopping for jet equipment in both the East and West. An order for Vickers VC10s has been under review together with possible other contracts for British aeroplanes, but Poland's foreign exchange resources pose difficulties. For instance, restrictions on the amount of Polish bacon England is prepared to import have proved a major obstacle in selling British aeroplanes to LOT. Russia, on the other hand, has no pure jet aircraft suitable for use on a trans-atlantic route.

Attracting North Atlantic Traffic

A LOWER individual excursion fare and cheaper group fares for the North Atlantic are among the points for discussion at this week's informal meeting of IATA airlines in Bermuda.

The new excursion ticket (at about £130 return, London-New York) would, if approved, be valid for a period of up to 23 days and be available throughout the year from April 1, 1962, for weekday travel only. The present lowest fare is the 17-day winter excursion rate of £114 return.

With the idea of combating the inroads of charter operations, a new group fare, for 30 or more persons, is also being considered.

Previous informal meetings of the North Atlantic operators have been held in London and New York. No agreement was reached at these meetings.

Breaking the Monopoly in India

INDIA'S two State-owned airlines will lose their monopoly of scheduled operations under a proposed amendment of the Air Corporations Act. Introduced by the Minister of Transport and Communications, the amendment would allow private operators to fly scheduled air services for a limited period on routes where neither Air India nor Indian Airlines are in a position to operate. Under the new policy, Kalinga Airways is expected to be licensed to operate on the route Bombay-Baroda.

Other clauses in the proposed amendment would drop the "International" from Air India's title, and dissolve the Indian Air Transport Council, which currently has no work.

Indian Airlines is negotiating to purchase four second-hand Viscounts to augment the 10 owned at present. One of the latter was seriously damaged on Nov. 15 in a landing accident in Colombo. The Corporation is also planning to purchase turbojet transports for operation by 1963-64, if foreign exchange can be obtained.

Air India plans to introduce Boeing 707s on its routes to Sydney, Djakarta and Moscow next May, following delivery of two more of these aircraft. As the 707 cannot use Madras Airport, a Comet 4 is to be chartered from B.O.A.C. to operate services between Bombay and Djakarta via Madras.

All nine Air India Super Constellations will have been transferred to the Indian Air Force by May, 1962.

TRIALS COMPLETED.—Airworthiness testing of the Avro 748 has now been completed and the A.R.B. has recommended issuance of an unrestricted C. of A. The first delivery of a certificated 748 is expected to be made early in the new year to Aerolineas Argentinas. Following the route flying of the first production 748 by Skyways (right) this aircraft is now on a demonstration tour of Europe and the Near East.

Photograph copyright "The Aeroplane and Astronautics"

Air Transport . . . .

Co-ordination in Canada?

A CHANGE in official Canadian thinking about airline competition was confirmed last week when Mr. L. Balcer, the Minister of Transport, said that "it is my opinion that, given the competition now existing in World aviation, the best interest of T.C.A. and C.P.A. will not be served if, in addition to competing with foreign carriers, they are competing with each other." Mr. Balcer said that the efforts of the two carriers "should not be devoted to fighting each other. These efforts should be aimed at the foreign competition which must be successfully countered if Canada's international airlines are to survive."

Tentative moves were being made three months ago towards the achievement of a merger between the two major Canadian carriers, but, according to recent reports from Canada, some kind of co-operative agreement is the more likely prospect.

At any rate, the speech by Mr. Balcer—made at the opening of T.C.A.'s new Vancouver maintenance base—is in marked contrast to the fact that, as recently as last summer, the Canadian Government approved a competitive North Atlantic C.P.A. service between Vancouver, Edmonton, Calgary and London. This service, due to start on Oct. 7, was not approved by the British Government (see our issue of Oct. 26, p. 540) and the firm U.K. opposition may well have caused a return to the earlier Canadian policy in which no international competition between the two Canadian carriers was permitted.

Reaction to London-Dublin Competition

AER LINGUS—already concerned with the demand by Pan American and T.W.A. for terminal and "beyond" rights at Dublin (see last week's issue, p. 716)—has reacted strongly to the threat of a third carrier on the London-Dublin route. A licence for this route by Cunard Eagle has been approved by the A.T.L.B. for operation from April, 1963.

The general manager of Aer Lingus commented last week that the appearance of another operator on the Dublin to London route (Aer Lingus' most remunerative service) would have "frightfully serious consequences for Irish airlines. The relationship between the two sovereign states in respect of traffic rights is," he continued, "reciprocal, so that airlines of each country can have 50% of the traffic." The entry of a third carrier on this route might call for a re-investigation of the arrangements made in 1956 when the present U.K.-Eire agreement came into force.

"If, by any chance," he added, "the U.S. lines succeed in getting into Dublin, the position by 1963 could show five airlines operating on the Dublin-London route. Again, over-competition would kill all the companies and there would be the situation you have in America itself, with mergers and take-overs."

"No-show" Penalties Again

PENALTIES of up to $50 (£18) may be imposed on passengers who fail to take up bookings on U.S. domestic flights. A proposal to introduce penalties of half the ticket price, with a $5 minimum and $50 maximum, has been put to the C.A.B. by the domestic trunk airlines.

This plan is the latest attempt to reduce a widespread problem. More than 10% of all U.S. domestic bookings are estimated to result in "no-shows" without prior cancellation. C.A.B. approval is likely, as the Board itself asked the airlines to devise the plan as part of a campaign to reduce operating costs. Anti-trust laws were temporarily suspended to allow the airlines to plan collective action.

Other matters being discussed by the airlines under similar immunity are the restriction of food and beverage services on coach flights and the joint use of facilities, equipment and supplies.

Boeing 727 Programme

TWO non-flying airframes and four complete aircraft are to be used by Boeing in obtaining F.A.A. certification of the Boeing 727 by the end of 1963. The pre-service test programme will cost nearly $30 million and, extending over a two-year period, will be more complete than that conducted on the Boeing 707. Already the company has completed some 4,500 hr. of wind-tunnel testing and about 250 flight hours on the Dash-80 prototype in connection with Boeing 727 features.

Structural testing of the first non-flying airframe will begin next November and will be a test to destruction under static load. Dynamic testing of the second airframe will begin in April, 1963, and a 16-month test programme has been prepared based on a one-hour cycle representing an eight-hour flight.

A full-scale operational 727 control test rig is now nearing completion, consisting of a complete control system from cockpit to flight surfaces, including associated hydraulic systems, with actual aircraft parts used wherever possible.

Flight testing of the Boeing 727 will begin next autumn and the first four production aircraft will be used for certification. One of these will be specially equipped for structural flight testing. The company flight-test programme will be followed by performance and systems demonstrations and functional and reliability tests for the F.A.A. leading to certification late in 1963. Deliveries to airlines for crew familiarization will probably begin a few weeks before certification.

The manufacturing programme for the Boeing 727 began on Dec. 5, 1960, and is reported to be on schedule. Contracts worth $122 million have been placed with 500 sub-contractors and suppliers, covering approximately 50% of the structural items and 75% of the equipment items.

A Reprieve for Northeast

BY a three-to-two majority, the Civil Aeronautics Board has voted to allow the Hughes Tool Co. to offer financial aid to Northeast Airlines. A decision has been deferred, however, on the wider question of Hughes obtaining complete control of the airline (see our issues for Nov. 23, Nov. 30 and Dec. 7).

The C.A.B. decision appears to be less assuring than Hughes required and it was not known, at the time of going to press, whether the necessary finances would be made available to cover Northeast's fuel bills until the beginning of the New Year. The airline has indicated that it can return to a profitable operating basis as soon as the winter traffic on the Florida route reaches its peak. This will not solve Northeast's long-term problem but will allow it to meet its immediate expenses.

At the C.A.B. hearing on Nov. 29, Hughes asked for an assurance that, in helping Northeast, earlier C.A.B. injunctions would not be infringed. This assurance has not been given.

The C.A.B. decision was reached only after the vice-chairman, Mr. Robert Murphy, had been recalled from Ireland. His vote was in favour of Northeast receiving financial help from Hughes. Also voting in favour were the C.A.B. chairman, Mr. Alan S. Boyd, and Mr. G. Joseph Minetti. Two members, Mr. Chan Gurney and Mr. Whitney Gilliland, voted against. The decision was to have legal effect from yesterday.

The Vertol 107 Accident

FURTHER details are available of the accident to the Vertol 107-II N6671D, which we recorded last week. On Nov. 27 the first production aircraft was seriously damaged by fire after ground impact during heavy landing trials, but the crew of two escaped without injury.

The accident occurred during the official F.A.A. height-velocity phase of the flight-test programme, which was to determine low altitude and low forward-speed limits for safe landings in the event of engine failure. The final arrival was the 238th landing in a rigorous series conducted with this aircraft, and followed a simulated engine failure in hover at a low altitude. Power on the remaining engine was deliberately limited to that anticipated on a hot day, the precise setting being equivalent to an ambient O.A.T. of 100°F. (37.8°C.) at 2,000 ft.

Take-off gross weight for this series was 19,300 lb., which is rather above the normal figure, and the C.G. was 17.5 in. aft. representing extremes of conditions for certification. The landing was made at a vertical velocity of 25 ft./sec., which compares with the structural acceptance of 15 ft./sec. proved in practical tests. F.A.A. and military absorption requirements for helicopters are apparently 8.3 ft./sec.

The excessive ground impact caused failures in the fuselage frames supporting the landing-gear structure and fuel spilled from separated lines was ignited by sparks generated from contact with the runway. Witnesses estimated that 2-4 minutes elapsed before the fire spread to the fuselage. All the aircraft forward of the landing gear stubs was burnt before fire-fighting equipment came into action, and fire damage also occurred in the aft section of the fuselage.

Fuel spillage resulted from separation in the single-point fuelling and cross-over line, which requires a 3-in.-diameter pipe running between the rear stubs and under the cabin floor. This system applies only to the five Vertol 107-II helicopters for the first customer (New York Airways), and redesign of the single-point refuelling system, and valve changes in the cross-over pipes, will guard against a recurrence of fire in the event of excessively hard landings.

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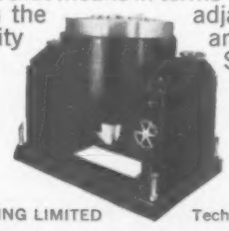

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A.175	1,500
L245	2,250
V.1001	3,000
L300	5,000
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THE AEROPLANE and ASTRONAUTICS
DECEMBER 14, 1961

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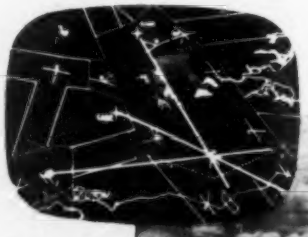

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Fuller details given in Radio Leaflet 312.

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61/2E

FLYING FERRY.—The prototype Aviation Traders Carvair, a vehicle ferry conversion of the DC-4, is now nearing the end of its certification programme. Channel Air Bridge plans to start Carvair services next spring.

Air Transport . . . .

France's Domestic Services

AIR INTER—which has been in existence since 1954 and which started scheduled domestic operations in France last year—has been losing money. During the introduction of the commercial aviation budget to the French Senate, it was stated that in and after 1963 the airline would be subsidized by the State. It is likely that a loan will be made so that it can purchase its own fleet of aircraft—probably Viscounts from Air France. At present, Air Inter uses aircraft leased from Air France, T.A.I. and Airnautic.

Measuring Engine Reliability

IN-FLIGHT engine-shutdown frequencies will be used to provide a measure of reliability for an experimental period in the U.S.A. The programme, mentioned briefly in our issue for Nov. 16, has been worked out jointly by the Federal Aviation Agency and the U.S. airlines. Its object is to control reliability through an analysis of the factors that affect it and to provide a system of action to improve low reliability levels when they exist.

Each airframe/engine combination has been allotted an "alert value" of engine shut-downs per 1,000 hours (excluding shut-downs for test or training purposes). If an airline records a shut-down rate in excess of this value during any three-month period, F.A.A. and airline engineers will together analyse the reasons and develop a corrective programme.

As an example, such a corrective programme might call for: increased inspection frequencies or changed inspection procedures; a campaign to obtain more reliable components; alteration of operational procedures or limits; additional maintenance and/or flight training; improved parts design by the manufacturer; and reduced overhaul times.

In working out the necessary action, the airline will be able to take advantage, through the F.A.A., of the experience of other operators in dealing with similar problems.

Alert values have been established as follows:

0.30 shutdowns per 1,000 hours: R-2800 in Martin 202, Martin 404 and Curtiss C-46; Dart in Viscount; R-1820 and R-1830 in DC-3; JT3C in Boeing 707, Boeing 720 and DC-8; JT4A in Boeing 707 and DC-8; CJ805-3 in Convair 880.

0.40 shutdowns per 1,000 hours: Dart in Fokker F-27; R-2800 in Convairliner series and DC-6 series.

0.50 shutdowns per 1,000 hours: R-2000 in DC-4; R-4360 in Stratocruiser; Allison 501-D13 in Electra; Wright C18 in Constellation 049, 149, 749 and 1049.

0.80 shutdowns per 1,000 hours: Wright TC-18 in DC-7 series, L-1049C, G and H, and L-1649.

These alert values are subject to adjustment from time to time, either upward or downward. If the six-month test programme is a success, it will be extended to other airframe systems and may eventually provide a yardstick by which total aircraft reliability can be measured.

Runway Collision Risk

SIMULTANEOUS transmission of RT messages, causing "blocking" of both messages, is a growing hazard in congested airspace. The latest issue of *Flight Safety Focus* reports a recent occurrence which led two aircraft to start their take-offs simultaneously from conflicting runways at the same airport.

In this incident both take-offs were aborted, resulting in blown tyres and delayed flights. The investigations showed that the two aircraft had flight numbers in which the first two digits were identical. When one flight was cleared for take-off the message was misunderstood by the other. Both acknowledged the clearance simultaneously, so that these messages to the tower were blocked by each other.

What might have been a major disaster appears to have been avoided in this case by cockpit vigilance. An even narrower escape, which has yet to be explained, was the collision at Logan International, Boston, on Nov. 15 between a Viscount and DC-6B. A number of passengers was injured. The Viscount was landing and the DC-6B was taking-off. Transmission blocking obviously could have been a factor in this accident also.

Passenger Report on the Munich Incident

THE violent changes in fore-and-aft attitude which caused injuries on Nov. 27 to a number of passengers in a B.E.A. Viscount on a Munich-London service (see last week's issue, p. 721) have been the subject of a great deal of comment.

A report from one of the first-class passengers, who was interviewed in Zurich, helps to clear up a number of points. This passenger was sitting in a position some distance aft of the centre of gravity and thus suffered considerable *g* loads. He was, however, one of the few passengers who were strapped in at the time and retained a clear recollection of the features of the incident.

The occurrence, he said, was not preceded by any abnormal turbulence, but the aircraft was suddenly subjected to between four and six rapid reversals of attitude in the pitching plane. There was no suggestion of yaw or roll.

After the first violent downward change of attitude, passengers were pressed hard down into their seats and immediately afterwards thrown towards the roof. As they descended towards their seats again they appeared to be struck by the aircraft going into another dive. During the period of the oscillations the passengers had no chance of stabilizing themselves and very few even managed to hold on to anything.

After some 15 seconds complete control appeared to have been regained and normal flight was resumed. At this point considerable

Air Transport . . . .

COMET TO MADEIRA.—The runway at Porto Santo, one of the two main Madeira islands, was opened for use this year, permitting a through service as an extension of the T.A.P./B.E.A. London-Lisbon service by Comet. As can be seen here, Air BP has established fuelling facilities with a 1,500-gal. Kent fueller and a 2,000-gal. trailer.

anxiety was felt regarding the possibility of subsequent structural failure. The passenger said that he did not recollect any broadcast instructions or messages from the cockpit, and that no cockpit-crew member appeared aft of the central bulkhead.

In the rear part of the aircraft only four persons were in a position to render assistance to the injured — the interviewed passenger, the stewardess (who had a leg injury), one steward who was bleeding, and a second steward who came, unscathed, from forward.

The pattern of injuries was fairly well defined, those farthest from the "fulcrum point" having suffered most. There was a considerable amount of blood about, mainly from facial and head cuts and lacerations. Some passengers were in great pain due to broken bones and one had clearly dislocated his shoulder.

Several first-aid kits were produced, but the narrow bandages proved inadequate for this particular emergency. They contained insufficient cotton wool and gauze to staunch wounds, and so a steward's jacket and other items of clothing were torn up to form wads. There was, naturally, a shortage of water; gin was added to what there was to act as a disinfectant. No morphia was administered in the rear section of the cabin.

The approach and landing appeared to be entirely normal and the aircraft taxied straight up to the apron. The first person to come aboard was a civilian, who asked how many wounded there were—which indicated that a message about the passengers' predicament must have been received by the control tower. The next people to appear were a few cleaners who removed some of the debris and then made off. Meanwhile, nobody left the rear part of the Viscount and the aircraft had been 19 minutes on the ground before the first ambulance arrived.

All but three or four of the passengers were able to walk to the terminal, although most of them needed some assistance. It proved impossible to bring stretchers aboard and so the more seriously injured were carried out with some difficulty.

Many of B.E.A.'s staff were in attendance at the airport building some clearly having come back on duty. The passenger told us that he did not hear any explanation of the occurrence being given to the passengers before they dispersed.

ITA—World-wide Air Transport Study Association

FROM time to time a brief mention is made in one or other quarter of the Institut du Transport Aérien (sometimes anglicized into "Air Transport Institute," although this international body retains its French name). Possibly there will be a reference to one or other of its studies—supersonic airliner feasibility; economic and social consequences of air transport in Common Market countries; significance of inclusive tours; European hotels and the volume of U.S. travellers; flight-manual standardization; or the layout of freight terminals. On the whole, however, knowledge of these studies and of their authors remains confined to the specialized circles which are using them.

The Institut du Transport Aérien (ITA) acts as a co-operative study association for its members only, who are scattered throughout the World in every field directly or indirectly concerned with air transport and/or the economics of transport, and thus include not only civil aviation authorities, airlines, airports and manufacturers of aviation equipment, but also universities, surface carriers and others. *Inter alia*, the civil aviation authorities of 34 countries and 30 IATA-member airlines are members of ITA—which means that they take part in its general meetings, have a say in directing its programme, and so make ITA a collective instrument of work which also serves each individually and directly, in the ways explained later in this article.

The form is that of an international non-profit association. The founder was Henri Bouché and the present board, under J. Roos as chairman, has as members W. Deswarte, P. Morini, H. Bouché and L. de Azcarraga.

The original idea was to have an information and study centre available to all branches of aviation activity in France. Very soon, however, the Institute grew out of its original framework in almost every respect, becoming first European, then World-wide in status, and diversifying its activity to become consultant, computer and even oracle on the most varied of aviation and transport problems. During September, 1961, ITA was asked to carry out some 30 different studies of varying scope in technical, economic and policy fields. Research on the economy and sociology of transport as a whole covers Europe and other developed areas as well as less advanced regions—requests frequently coming from countries of recent nationhood.

The work of ITA can be split into six groups:—

(1) As economic and technical adviser, ITA carries out exhaustive surveys and studies for the benefit of individual members or groups of members. Some of the studies so carried out have taken upwards of a year and have been instrumental in reaching major policy decisions.

(2) As a study centre, ITA puts out regularly, in English and French, a weekly Bulletin (containing basic material through which the major problems of air transport can be regularly followed, as well as periodic reviews or studies of particular points) and three separate series of Research and Information Papers under the work programme laid down at general meetings and by the board.

(3) As a consultant, ITA dispatches a minimum of three brief factual notes a week, established at short notice in answer to requests for information or advice, and embracing a wide variety of subjects.

(4) The library, new additions to which are regularly reported to members, lends and obtains material throughout the World.

(5) Less fully developed for the time being is ITA's function as a training centre, but already short individual courses have been given to students of many nationalities, in addition to upwards of 100 hours' lecturing yearly in universities and training schools. It is rare for the reading room to have no student in it—working feverishly, or leisuredly, to prepare a thesis.

(6) ITA plays another part in international activity through its status with ICAO, the European Civil Aviation Conference, IATA, the International Chamber of Commerce and the Common Market. Panels of which ITA staff are currently members are the ICAO Airworthiness Committee and the IATA Ground Handling Advisory Group, and ITA experts attend many other international meetings, for which studies and reports are frequently prepared.

ITA's international character, which it did not have at the outset, was stressed at the last board meeting, held at Schiphol and attended by Prince Bernhard of the Netherlands, who shares with Prof. Th. von Kàrmàn the honorary chairmanship of ITA.

A permanent staff of 32, with J. Mercier as director, is based at the Paris offices*, and includes mainly, but not exclusively, people with aviation backgrounds (M. Mercier himself is a professor of transport). The working languages are French and English, but German, Spanish and Italian are also used.

* 4 rue de Solférino, Paris 7.

OPtional Reading—24

IN OPtional Reading 6 I raised doubts about the acceptability of full automation in the fields of air traffic control and landing; I drew an analogy from the case of automatic medical diagnosis and prescription based on punched card inputs of the various symptoms of the patient. At the time I thought that the proposal belonged to the realms of the fantastic but, to my surprise, I now learn that an American university has taken up the idea (not necessarily from this column!) and has begun by feeding in to a computer replies to some 296 yes/no questions put to the patient.

The aeronautical world might do well to follow this experiment closely as a cross-check on the degree to which the average man is prepared to hand over his life to a computer. In my judgment he might, after a period of conditioning, let it feed him with aspirins but I doubt very much whether he would accept from it an answer prescribing a major operation. At least he would not accept it without the independent backing of the specialist and the surgeon. This is important because it points out that, in really vital decisions, the human agent must be kept in the loop all along and, moreover, must be capable of taking over where the computer leaves off.

Apply this to automatic landing and you fetch up with the computer taking you down to 100-ft. ceiling and, say, 200-yd. runway visual range, but no farther *unless the pilot is able to follow through.* But this is just what is difficult. I do not wish to be discouraging to my friends in the industry who have put such enormous effort into automatics; indeed, I would go a long way with them—but not all the way. The problem, however, is not one of technical feasibility (some thousands of automatic landings have already been made), but of practicability in the day-to-day conditions of airline operation.

You may recall the god Aeolus who kept all the winds imprisoned in a mountain; they spent their time rushing round and round (*monte immenso gurgite vasto*) but every now and then one would escape, to the great devastation of the Trojan ships. Well, Aeolus should be grateful that he had only three or four winds to look after and not a mob of electronic impulses as well, chasing each other round in labyrinthine black boxes. The manufacturers of automatic landing equipment have both to cope with. And I must say that, so far as the airborne black boxes are concerned, they are doing very well; I have little doubt that, with the duplexing or triplexing of all essential channels, a reasonable level of safety (A.R.B. prescription better than 10^{-7}) can be achieved from 200 ft. down to the ground. My main concern is getting the correct electronic and aerodynamic signals into the receiver and the correct dynamic responses out of the aircraft. If we are talking about "all-weather landing" this means at least up to the moment when the aircraft is clear of the runway.

Let us look first at the input signal. Here, of the several systems which are available, it would appear that philosophies are moving rapidly towards the pepped-up ILS; however, before turning to this, it may be as well to pay some attention to the others. The leader cable undoubtedly gives a more positive signal than the ILS in the critical pre-threshold area and could also take the aircraft all the way down the runway, but apparently it suffers from some grave disability—said to be connected with the demands from real estate outside the aerodrome boundary, but perhaps really the intolerable anti-social fault of interference with television.

The Bell radar system, catching, by means of a ground-based computer, a corner reflector mounted on the aircraft—comparing the aircraft's actual with its desired position in space and feeding the correct command signal by data link and ILS receiver to the autopilot servos—has a problem with ground returns when the aircraft is really low, and it is difficult to see the combination of a diffuse radar input and data link providing a probability of failure as low as 10^{-8}, the minimum figure needed to get an overall failure rate of 10^{-7}.

Decca propose to employ their survey-work (truck-mounted) system consisting of a master and slave station sited close to the runway and giving a straight course signal to an accuracy of about 1 ft. down the runway and 8 ft. down the approach path; this accuracy is phenomenal and, with the short ranges involved and reasonable transmitter power, I do not see why this system should not give an overall performance of the required order of reliability; moreover, it is a portable system, requiring only one set of (presumably duplex) equipment per aerodrome and has a distance-measuring potentiality as well. The main snag, as I see it, is that it is a late starter: but that is a disadvantage only if the others in the race are as good or better. Is the ILS azimuthal signal as good?

The answer is no; however, it can probably be made good enough, provided that the controlling authority is prepared to put in 117-ft. "waveguide" antennae (presumably duplex) on the end of each runway used in bad weather. The F.A.A. have just released a report on the performance of the Meacham Field experimental ILS; undoubtedly it has straightened up the on-course signal out of all recognition and it looks as if, in the hands of an expert maintenance team, the deviation can be kept within 0.1° on 100% of occasions (0.038° for 96% of the time); this makes the worst lateral displacement error, at the threshold of a 12,000-ft. runway, no more than 20 ft. A truly great achievement, and far be it from your humble columnist to say otherwise; but how many 117-ft. (duplex) waveguide ILS arrays are we likely to see about the World in the next 20 years? The F.A.A. has a programme to put in 10, but apparently it is not quite satisfied with the Meacham performance and so is committed to a further evaluation (at NAFEC, Atlantic City) of a 300-ft. array; it also talks of the possibility of increasing the vertical dimension from 5 ft. to 15 ft. So, assuming these experiments to be successful, we may, at 10 U.S. aerodromes, see one end of the runway equipped with a (117 ft. to 300 ft.) localizer capable of giving a signal reliable enough for automatic landings. I do not know of any ILS developments likely to overtake this one.

The pace of this programme and the degree to which it can be extended into World-wide use is critical. That is one consideration I had in mind when, in OPtional Reading 6, I advised against putting all the eggs into the basket of automation. I will deal with a second reason next week.—C.C.J.

Sperry's First Helicopter Autopilot

FOLLOWING the showing of the pilot flight controller at this year's S.B.A.C. exhibition at Farnborough, the Sperry Gyroscope Co. last week held three one-day "presentations" on their Universal automatic flight control system. Developed by the Sperry Phoenix Co. of the United States under contract to the U.S. Army, this equipment can be applied to both fixed- and rotary-wing aircraft, although the U.K. company has introduced it as a helicopter aid only.

An attitude stabilization and flight-path guidance system, the autopilot [AN/ASW-12(V)] is now completely developed and in production in the U.S. where approximately 100 installations are in existence. The system has been fitted in such helicopters as the Sikorsky H-34 and H-37, the Vertol H-21 and the Bell HU-1, and the U.S. Army's Grumman YAO-1 Mohawk and D.H.C. YAC-1 Caribou fixed-wing types.

In this autopilot, aircraft attitude stabilization is accomplished by electrical signals generated in gyroscopes which sense deviation from an established reference attitude. It has provisions for coupling to various navigation systems to provide the automatic flight path control, and three features—standardization of components, functional unit construction and "plug-in" calibration cards—are employed in the design.

The most important components in the control system are single package electro-mechanical rotary actuators, which are used to control the cyclic pitch, rudder pedals, collective pitch stick and throttle position. Longitudinal and lateral cyclic pitch actuation is obtained through differential operation. A vertical displacement gyro is used to sense the pitch and roll attitude of the helicopter, and compass system signals are employed for heading control.

An automatic navigation coupler houses the main engaging switches. Separate switches are provided for engagement of the attitude, altitude and heading controls of the autopilot.

Pilot command functions are integrated into the helicopter's primary control system. Changes of heading are commanded through application of a pedal force which is transformed into an electrical output by a transducer. A similar system is used to achieve pilot command of altitude through another transducer which is installed to respond to collective pitch control stick force. Permanent changes in roll and pitch are established by means of "beep" switches installed as integral parts of the cyclic stick grip. The collective pitch command control automatically disengages the altitude system in the event of engine failure.

Work started on the flight control system four years ago and flying trials began 18 months later. As already recorded the equipment is in production at Phoenix and Sperry have given an availability period of 6-8 weeks for one or two installations; where larger quantities are required the delivery rate is given as 20 a month, six months from receipt of the order. U.K.-produced equipment could be available in 15 months' time.

The system is manufactured in both three- and four-axis versions; the former is priced at about £6,000 and the latter at approximately £8,000. Sperry have made an offer both to Westland and the Ministry to install an evaluation system in either a Whirlwind Mk. 10 or a Wasp helicopter.

INTRO

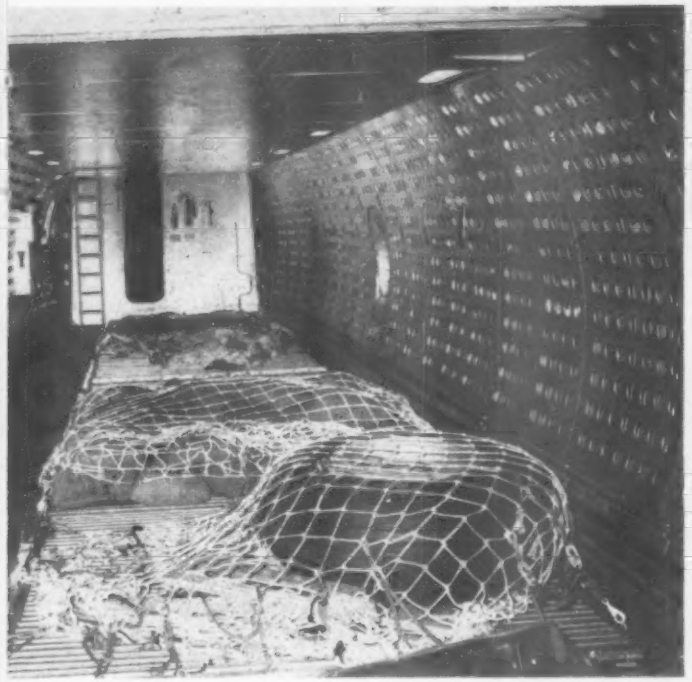
Above, during a route training flight last month, the first B.E.A. Argosy freighter was demonstrated at Dusseldorf. Regular services (to Milan) began on Dec. 1 and Paris and Jersey have now been added to the network.

Below, a palletized freight load is handled by a fork-lift truck during demonstrations at Frankfurt.

Above, a pre-flight cockpit check, with two pilots under training and a training captain in the left-hand seat.

Below, throughout last month, Argosy flight crews were undergoing training at Stansted. Left to right here are Capt. Garnett, F/O Hare, Mr. W. Johnson (airframe instructor) F/O Cox, Mr. J. Davidson (instructor, electrics), F/O Seed and Capt. Jones.

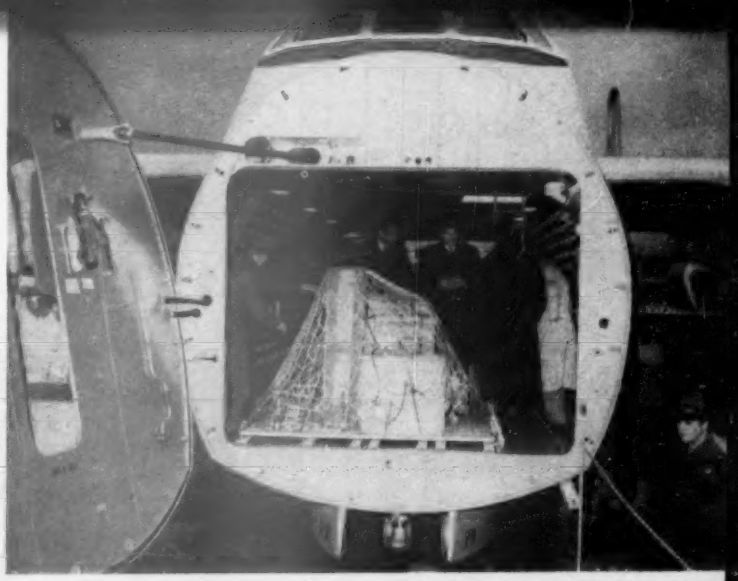
DUCING THE ARGOSY



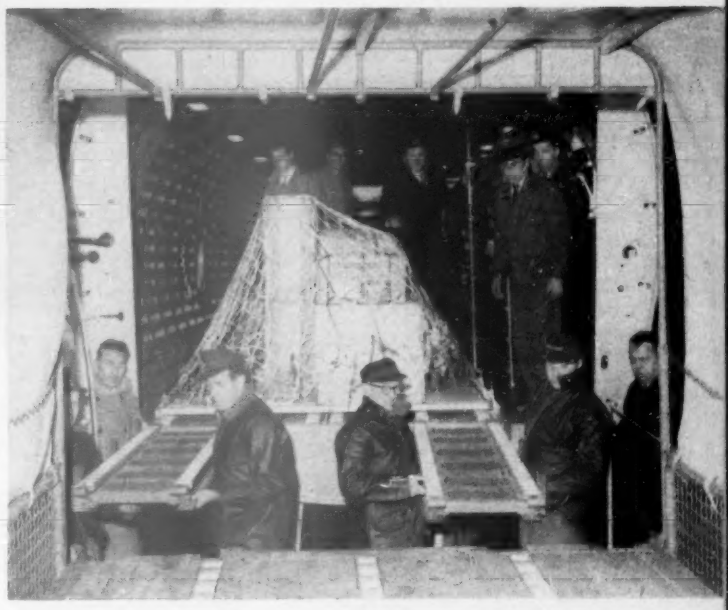
Above, a view inside the windowless hold of the Argosy, showing three pallets in place on the Rollamat track.

Photographs copyright "The Aeroplane and Astronautics"

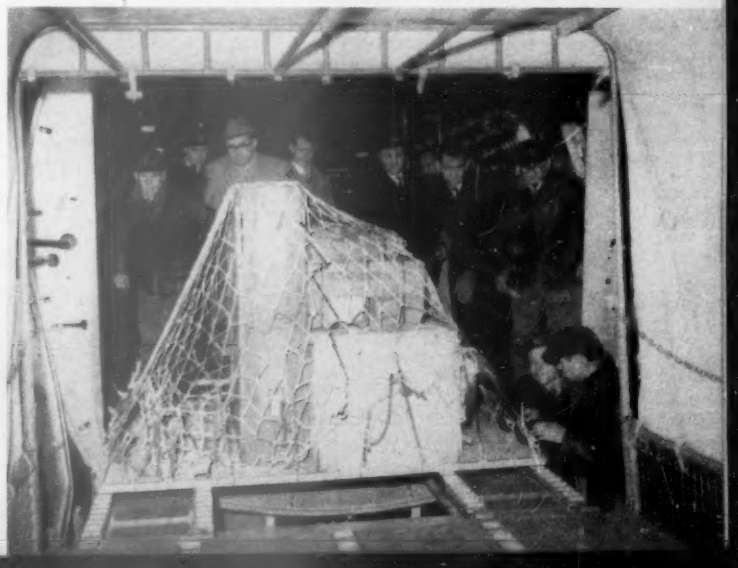
Below, the Argosy taxies out for a training mission at Stansted.



Above, clear access to the hold is available with the nose door open.



Above, Rollamat linking tracks are placed in position between aircraft and truck to allow pallets (below) to be unloaded.



The Fighting Services

No. 601 Squadron Standard

H.R.H. THE DUKE OF EDINBURGH is to attend a service at St. Clement Danes Church on Dec. 19, when the Standard of No. 601 (County of London) Squadron, R.Aux.A.F., is to be laid up. Honorary Air Commodore of the Squadron until its disbandment in January, 1957, His Royal Highness is also patron of the Old Comrades Association which now has custody of the Standard.

The service at the Church of the R.A.F. is to start at 15.30 hrs. and will be conducted by the chaplain, the Rev. T. Ryder. The Standard will be carried by Mr. Desmond Norman, one of the three sons of the late Air. Cdre. Sir Nigel Norman, who commanded the Squadron from 1931 to 1934; all three sons served with the Squadron. Sqn. Ldr. F. R. Edelston, who was C.O. when the Squadron disbanded and is now president of the Old Comrades Association, will hand over the Standard. In the escort party will be four former members of the Squadron, S. C. Vickers, S. Venn, C. Cates and E. Lanser.

Flying Training Moves

DURING this and the next few months a number of R.A.F. aircrew training schools are moving to new stations.

The Air Electronics School at Hullavington is being transferred to Topcliffe this month and No. 2 Air Navigation School moves from Thorney Island to Topcliffe in January of next year. The Transport Command operational training school at Dishforth is also moving in January to Thorney Island and Headquarters, No. 23 Group, Flying Training Command, will take its place at Dishforth in March, 1962.

In mid-1963, the Advanced Flying Training School at Swinderby will be moving to Valley.

Earlier this year No. 6 F.T.S. was transferred from Ternhill to Acklington and No. 3 F.T.S. was established at Leeming, formerly the home of the all-weather advanced flying school. Another F.T.S. may be formed at Church Fenton, if the need arises. The Central Flying School helicopter unit moved from South Cerney to Ternhill last September.

Overseas Appointments

AIR VICE-MARSHAL J. G. DAVIS, C.B., O.B.E., has become Air Officer Commanding, Malta, and Deputy C.-in-C. (Air), Allied Forces Mediterranean, in succession to Air Marshal Sir Walter G. Cheshire, K.C.B., C.B.E.

In 1947 A.V.M. Davis first attended the R.A.F. Staff College and subsequently joined its directing staff. In 1951 he was at Headquarters, M.E.A.F., and two years later commanded R.A.F. Topcliffe. After taking the 1955 Imperial Defence College course, he spent three years as Director of Plans at the Air Ministry. Appointed S.A.S.O. at Headquarters, Bomber Command, in 1958, he became A.O.C., No. 1 Group, in June, 1959.

Air Vice-Marshal H. J. Maguire, C.B., D.S.O., O.B.E., has been appointed Senior Air Staff Officer, F.E.A.F., with effect from February of next year. Air Officer Commanding, No. 13 Group, Fighter Command, since November, 1959, he was previously S.A.S.O., No. 11 Group. He was S.A.S.O., Malta, from 1952 to 1955.

Deck Landing Pioneers

TWO Pioneer CC.1s of No. 209 Squadron (Sqn. Ldr. J. Cartwright, M.B.E.) based at Seletar, Singapore, have made unarrested landings on the deck of H.M.S. "Bulwark" off the east coast of Malaya. This is thought to be the first occasion since the Norwegian campaign of 1940 that R.A.F. fixed-wing aircraft have made such deck landings.

For the tests the flight deck wind-speed was reduced to 10 knots. Six pilots and one crewman of the squadron boarded "Bulwark" at Singapore naval base and the first aircraft was flown by the C.O., who made a "roller" before a full-stop landing. The Pioneer was then pushed back along the flight deck for a free take-off. Crews changed and each pilot completed a roller and two full-stop landings.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Gp. Capt. H. A. C. Bird-Wilson, D.S.O., D.F.C., A.F.C., and Wg. Cdr. F. J. Trollope, M.C., to the Department of the Chief of the Air Staff.

Bomber Command: Gp. Capt. F. L. Dodd, D.S.O., D.F.C., A.F.C., to R.A.F. Coningsby to command; Gp. Capt. M. H. Le Bas, D.S.O., A.F.C., to Headquarters as Group Captain (Plans).

Fighter Command: Wg. Cdr. B. H. Howard, D.F.C., to R.A.F. Wattisham to command the Flying Wing; Wg. Cdr. D. N. Shepherd, D.F.C., to R.A.F. Old Sarum to command; Wg. Cdr. P. G. K. Williamson, D.F.C., to R.A.F. Leuchars to command No. 25 Squadron.

Flying Training Command: Wg. Cdr. S. M. McGregor to R.A.F. Stradishall to command the Flying Wing; Wg. Cdr. S. C. V. Chiswell to Headquarters, No. 23 Group, as Senior Technical Staff Officer; Wg. Cdr. A. Vicary, M.B.E., to the R.A.F. Staff College, Bracknell, for directing staff duties.

Technical Training Command: Wg. Cdr. W. A. Thynne, D.F.C., M.M., B.E.M., to No. 4 School of Technical Training, R.A.F. St. Athan, to command the Boy Entrants' Wing; Sqn. Ldr. G. Bates, D.F.C., A.F.C., to R.A.F. Halton to command No. 3 Aircraft Apprentices Wing, with acting rank of Wg. Cdr.

Maintenance Command: Wg. Cdr. K. R. Penry to Headquarters for organization duties.

Other Appointments: Wg. Cdr. R. C. Haine, D.F.C., to the Ministry of Aviation with acting rank of Gp. Capt.; Wg. Cdr. S. L. Gordon to the Ministry of Aviation.

More Service News

Whirlwind Trials.—Three of the Gnome-engined Whirlwind HAR.10s now undergoing intensive trials with No. 225 Squadron at R.A.F. Odiham have completed their first 100 flying hours. This is an average of 5 hr. per day, the trials having been started on Nov. 6.

Leuchars Replacement.—A second Javelin squadron, No. 25 commanded by Wg. Cdr. P. J. K. Williamson, D.F.C., has moved to R.A.F. Leuchars to replace No. 151 Squadron, which, for the second time in its life has been disbanded. Until recently, No. 25 Squadron was stationed in Cyprus.

Anti-submarine Exercise.—A feature of the recent Anglo-American anti-submarine exercise "Lime Jug" in the Atlantic was the close co-operation between the two Navies. Royal Navy Whirlwinds from No. 819 Squadron embarked in U.S.S. "Essex" and operated with U.S.N. aircraft throughout the exercise period. Coastal Command Shackletons also took part.

Maritime Trophy.—No. 11 Neptune Squadron, R.A.A.F., has become the first unit to win the Fincastle Trophy, presented to the R.A.F. for annual competition between the maritime air forces of the Commonwealth. At a small ceremony at Australia House last month, Air Vice-Marshal A. M. Murdoch, Head of the Australian Joint Services Staff, received the trophy on behalf of No. 11 Squadron from the donors, Mr. and Mrs. Aird Whyte, who presented it in memory of their son killed in action with Coastal Command in 1943.

R.A.F. Recruiting.—Twenty-four per cent. of all R.A.F. entries during the three months ended Sept. 30 came from members of the Air Training Corps and R.A.F. sections of the Combined Cadet Force. Recruits from all sources during the period totalled 3,429, of whom 751 were former A.T.C. members and 74 had served in the C.C.F.

STEER LIFT.—One effect of the Kenya floods has been the disruption of the meat supply to Mombasa and the Royal Navy was asked to help in ferrying cattle across the swollen Sabaki river. Whirlwinds from the carrier "Victorious" lifted 150 steers across the flooded area in underslung nets and are planning to repeat the operation if necessary.

France's Flourishing Exports

By J. F. Simon

EVEN the French people have learnt with some astonishment that France is now delivering beyond her frontiers a larger percentage of her aeronautical production than the United States or Great Britain. Whereas her exports have been growing regularly during the past five years, in this field they shot up in 1960 and during the first months of 1961.

The total value of export orders recorded by all French aeronautical manufacturing companies was NF 450 million (£32.5m) in 1959; NF 1,150 million (£83.5m) in 1960; by the middle of October, 1961, the figure had already reached NF 1,500 million (£109m), and will no doubt prove to be NF 1,800 million (£130m) by the end of the year. For the first time in the history of the French aeronautical industry, the total of export orders obtained by manufacturers has exceeded —in 1960—the amount of currency necessary to meet the needs of air carriers and that for buying war material abroad.

Of what equipment do these exports consist, and how is this success explained?

The success of French exports has been in three fields: direct sale of equipment abroad, granting of manufacturing licences, and entering into agreements for international co-operation.

Of the total of NF 1,150 million (£83.5m) for orders recorded in 1960, the share of the airframe manufacturers was NF 810 million (£59m). Then came sales of equipment at NF 180 million (£13m); Nord Aviation missiles at NF 145 million (£10.5m), and engines at NF 81 million (£5.9m). Foreign buyers were particularly interested in transport aircraft (and principally in the Caravelle, of which mention will be made later), fighters, bombers, training and liaison aircraft, helicopters, and short-range ground-to-ground missiles and target missiles.

The following Table gives the situation, as at Oct. 1, 1961, regarding French and foreign orders to airframe manufacturers, and shows that France's clients continue to be, in order of importance: Federal Germany, the Argentine, Australia, Belgium, Brazil, the United States, Finland, India, Israel, Sweden and Switzerland.

Some licences were granted some time ago—for example, that for Turboméca gas turbines in 1951 to an American company, which now manufactures more than the parent company. In 1960, Australia and Switzerland bought the licence for the Mirage III from the Dassault company and Federal Germany that for the CM191 from Potez-Air-Fouga. Then there are the agreements signed on Nov. 18 last, between six (the Breguet company among them) European and American concerns for manufacturing a VTOL fighter, and the more recent one for projects now under study with the British Aircraft Corporation.

France's aeronautical industry is bound by a close network of agreements for international co-operation, one of them being particularly characteristic of the way in which manufacturers and public authorities draw up and establish reciprocal contracts. This agreement concerns production of the military cargo aircraft, the Transall, the first prototype of which will fly in October, 1962.

The French and the Germans had already got into the habit of working together when Germany bought the licence for the Noratlas. The Transall is the result of studies begun in June, 1958, when a tripartite commission composed of delegates from the three interested French, German and Italian ministries drew up a programme corresponding to the transport needs of the air forces of the three countries. Two projects were thereafter retained, a French and a German one and in January, 1959, an agreement was signed for the design and manufacture of the aircraft.

A team of Nord Aviation engineers then studied a common project at Bremen with representatives of the Weser and Hamburger companies, and of the design office (Blume), all three German. The final contract was signed in March, 1960. The distribution of work gives Nord Aviation responsibility for the manufacture of wings and turbine engines; the Germans have the fuselage and the tailplane.

This agreement is interesting on more than one count. It was difficult, because certain reflexes of rivalry born of the War had to be overcome. But, on the other hand, it was facilitated by the collaboration which had been set up in relation to the Noratlas. Above all, it was a trial agreement which, in the minds of the directors of Nord Aviation and the public authorities, was intended to prepare the way for others.

Nord Aviation could no doubt have produced the Transall on their own. But they wanted to give the Germans a share in the "coup," thus preparing the way, in agreement with the Government, for the wider agreements on the European scale which are seen gradually to be taking on a concrete form in connection with the Super Caravelle.

These co-operative agreements have at times raised certain criticisms. They might, in effect, embarrass semi-public organizations such as the Office Français d'Exportation de Material Aéronautique (OFEMA), the rôle of which is to promote the sale of French equipment. But in reality those responsible for aeronautical manufacture often prefer to have the possibility of bringing in a foreign partner when a country

FRENCH AIRCRAFT FOR EXPORT (Production Lines in Progress) As at Oct. 1, 1961

Company	Type	Engines	To be Delivered for Export	Licences Granted	French Orders	Total Production put in Hand (French orders included)		
						In France	Abroad	Cumulative
Breguet	1050 Alizé	1 Rolls-Royce Dart	N.A. for 1 country ..	Nil	N.A.	92	—	92
Dassault	Mirage III	1 SNECMA Atar 9+1 S.E.P.R. ..	N.A. for 3 countries	Australia Switzerland	370	N.A.	About 130	About 500
Morane-Saulnier ..	760 Paris	2 Turboméca Marboré II or VI ..	55 for 8 countries[1]	Argentina	44	129	36	165
Morane-Saulnier ..	880 Rallye-Club and 885 Super-Rallye	1 Continental 100 b.h.p. or 145 b.h.p.	363 for 35 countries	Nil	167	500	—	500
Nord Aviation ..	Nord 2501 Noratlas	2 SNECMA Hercules (+2 Turboméca Marboré for the 2502)	44 for 3 countries ..	Germany	220	264	161	425
Potez	C.M.170 Magister ..	2 Turboméca Marboré II	144 for 6 countries[2]	Germany Finland Israel	310	454	261	715
Sud Aviation ..	SE.210 Caravelle ..	2 Rolls-Royce Avon or 2 General Electric	101 for 12 countries[3] (+48 options)	Nil	43[4]	175	—	175
Sud Aviation ..	SE.3130 Alouette II	1 Turboméca Artouste II	385 for 25 countries[5]	Sweden U.S.A.	395[6]	810	—	810

[1] Germany, 2; Argentina, 48 (licence comprising supply of 12 main assemblies and 36 sub-assemblies); Brazil, 30; Great Britain, 1; Iran, 1; Italy, 2; Morocco, 1; Switzerland, 1; U.S.A., 4; Venezuela, 1.
[2] Germany, 250 (of which 62 delivered by Potez and 188 built under licence); Austria, 6; Belgium, 15; Cambodia, 4; Finland, 60 (23/37); Israel, 40 (4/36).
[3] Aerolineas Argentinas, 3 (+3 options); Alitalia, 14; Finnair, 4 (+1); Iberia, 4 (+4); Royal Air Maroc, 2; Sabena, 3 (+2); S.A.S., 15 (+3); Swissair, 8 (hired to S.A.S. who have given an order); T.W.A., 20 (+15); U.A.L., 20 (+20); Varig, 2; General Electric, 1.
[4] Air France, 35 (of which some are by contract run by Air Liban and Tunis Air); Air Algerie, 6; S.G.A.C., 2.
[5] Germany, 205; Argentina, 3; Austria, 9; Belgium, 39; Cambodia, 2; Canada, 2; Congo, 3; Great Britain, 17; Iran, 1; Israel, 4; Italy, 1; Japan, 2; Laos, 2; Lebanon, 3; Morocco, 2; Low Countries, 12; Peru, 6; Portugal, 3; Dominican Republic, 2; Sweden, 25; Switzerland, 10; Union of South Africa, 9; U.S.A., 20; Venezuela, 1; Viet-Nam, 2.
[6] 365 for military purposes +30 for civil requirements in France and in Algeria.
N.A. = Number not available.

is, for one reason or another, temporarily closed to French buyers. This is at present the case with Turkey.

How can this expansion in sales of equipment or licences by French aeronautical industries, this increase in their range of activity illustrated by the multiplication of co-operative agreements, be explained? To begin with the most simple explanation, one may first point to the effort made by manufacturers for some years now not to remain simply "manufacturers," but to become "merchants" also. That is to say, they have made an effort to study the needs and tastes of clients so as to produce equipment adapted to needs, which will be followed during its entire useful life. This method appears obvious, but it has not necessarily been practised by all manufacturers until the past few years.

The commercial policy of the French aeronautical industry stands, according to its representatives, on the following four points:—

(1) Systematically to prospect markets to determine the sectors from which orders may be expected, and the characteristics of the equipment to be manufactured.

(2) Scrupulously to keep to delivery dates and the prices fixed. In certain cases facilities have been granted by the French Government who agree to material being taken from national orders so as to improve delivery dates on foreign orders.

(3) To supply to foreign users the technical assistance which they need, by training periods in the works or in French training schools.

(4) To establish a large after-sales organization. M. Georges Hereil, chairman of Sud Aviation, is in the habit of saying that "the sale begins with after-sales service." This tendency to improve the commercial service of the aeronautical industries is also encouraged by the public authorities, who have put at the head of the two largest national companies, Nord Aviation and Sud Aviation, men who are not technicians, but "salesmen" entrusted with representing their companies in the foreign circles which they know so well.

Internal Arrangements

The aeronautical industry has also made an effort to improve its output and quality by specialization and by avoiding too great a dispersion of means. This is how, in the powerplant industry, SNECMA has specialized in the manufacture of high-power engines, whereas Turboméca has specialized in the small and medium ratings, and Potez in engines suitable for light aviation.

In the airframe industry, there are still in France 15 or so manufacturers—which may appear to be abnormal, for example, by comparison with the situation in Great Britain. But, on the one hand, the greater part of the production facility is spread over only four companies, and there is a tendency for manufacturers to turn towards a single type of manufacture. Sud Aviation, for example, is devoting itself to commercial transports and helicopters; Nord Aviation to cargo aircraft, lightplanes and missiles; and Dassault to warplanes and to light transport and business machines, etc. On the other hand, numerous co-operative agreements link the different companies together, enabling them to spread the load and share the orders.

It is in this way that Max Holste shared manufacture of the Broussard with Sipa, and has now had to entrust a major share of the production of the Super Broussard to Nord Aviation. The Dassault company is fulfilling its contracts by calling on Nord Aviation and Sud Aviation, and has also made agreements with the latter company for building the Caravelle and for design work on the Super Caravelle. As for the equipment industries, these remain highly dispersed and, moreover, except for the minority, devote only a very small proportion of their activity to aeronautics.

Practical Encouragement

The State has made an effort to facilitate this concentration of, and specialization in, aeronautical construction. Directly or indirectly, part of the success of French exports is due to the intervention of public authority. The State is still, in fact, the first client, the first supplier, and the first owner of the aeronautical industry.

A programme-law, voted in 1950, fixed a term of four years for manufacturing objectives in the military field. This allowed important production lines to be laid down in the shops (Ouragon, Vampire, Mistral) for mass production. Manufacturers then complained that they no longer had a precise goal because no new plan had taken the place of the first.

They were, therefore, very satisfied in 1960 when a new military programme-law was voted and which is, furthermore, to be within the greater framework of the Fourth plan for modernization and equipment now under discussion. The aircraft provided for in the programme-law are, in limited numbers: Transall, Mirage III, Mirage IV, Etendard IV, Atlantic.

The State is, therefore, dealing directly with the products of the manufacturers and has, in particular, included in the national plan an aircraft, the Atlantic, which is defined and financed on an international plane. Again, through the medium of credits, by sharing in the cost of design and prototype construction within the civil aviation budget, the State is directing the productions of commercial aircraft manufacturers.

Thus it is that, in the 1962 budget, out of NF125 million (£9m.) payment credits, NF100 million (£7.2m.) is provided for the Caravelle and NF12 million (£870,000) for the Super Broussard. A total of NF1,671 million (£121m.) of credits is recorded for the purchase of military machines and for the improvement and design of civil ones.

By means of plans and the budget, the French State has henceforth given priority to military and civil equipment for export. The State is also taking steps to encourage the study of, and approach to, foreign markets. There is also at the War Office (Ministère des Armées) a Committee for National Aeronautical Expansion, which gives its opinion on the use of credits intended to encourage the propaganda effort of the French aeronautical industry throughout the World.

Lower down the scale the Office Français d'Exportation de Matérial Aéronautique (French Aircraft and Equipment Export Office) and the Office General de l'Air (General Aviation Office) are entrusted with the task of prospecting the international market at the request of companies. In a general way, the Government is making an effort to give manufacturers the benefit of its efforts in the European field, for example, by speeding up the freeing of exchange, or setting up common organizations.

The Government's reticence—which appeared very near to being relaxed on a project such as Air Union—has recently returned because of the purchase by a future partner, Lufthansa, of an American medium-range transport, the Boeing 727, in preference to a French aircraft (the Caravelle). On the other hand, the national company Air France supplies an excellent test bed and, at the same time, gives its preferences to civil transport machines.

By this whole series of actions the public authorities have, for some years, been stimulating or encouraging the vocation of exporter in the French aeronautical industry. But, paradoxically, the manufacturers have been obliged to export at a time when they can no longer count as much as previously on aid from the State. Today, the State is a much smaller customer for them.

Looking to Foreign Markets

The turnover of the whole of the aeronautical industry was last year about NF2,200 million (£160m.), of which sales to the State were not more than NF1,560 million (£113m.) against NF628 million (£45.5m.) sales abroad. This phenomenon is no doubt explained by a reduction in the production lines manufacturing military aeroplanes and missiles, but also by the war in Algeria, which has taken up part of the military credits without providing the aeronautical industry with a very substantial volume of orders.

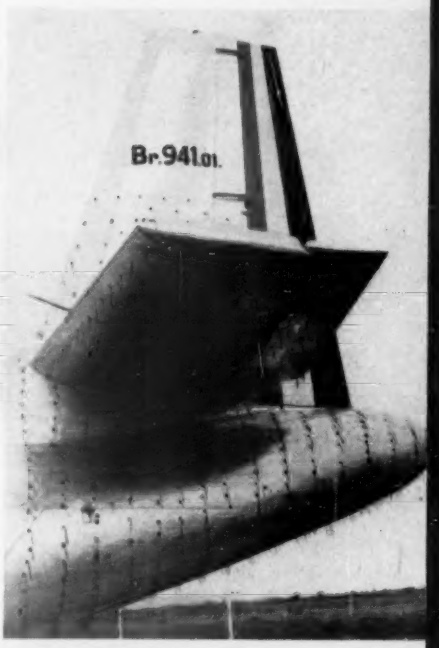
Circumstances have, therefore, compelled manufacturers to turn to foreign markets if they did not wish to reduce their programmes. It is this, in particular, that explains the importance assumed by the Caravelle operation. Manufacture of this machine is today occupying one quarter of the total force of the airframe industry and has, up to now, compensated for the reduction in military orders.

For how much longer will the Caravelle succeed in being at a premium in foreign markets? This is a question which, in France, is not only keenly occupying the aeronautical specialists; the latest debates in the Assemblée Nationale have well illustrated this. Prospects are encouraging for the present. Firm orders have been received for 142 machines, options have been taken up for another 41.

Future Prospects

Both manufacturers and the public authorities think, however, that preparations should now be made for the future. One hardly expected a decision on this subject to be taken so quickly. By deciding to build the Super Caravelle supersonic transport flying at Mach 2 or 2.2, the Ministerial Council of November 15 wished to prepare the successor to the Caravelle as soon as possible, and to take a place on the market between the present supersonic aircraft and the Mach 3 type, reserved, in principle, for the United States. The credits for the design and the prototype which should come out in 1965 are henceforth included in the Fourth plan in the sum of about NF825 million (£60m.).

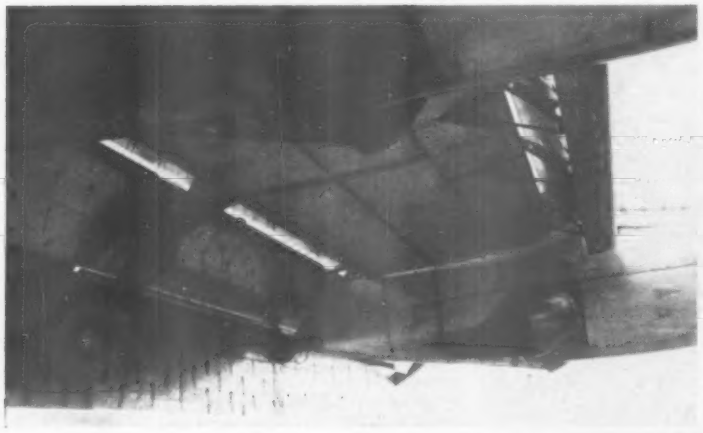
Now the decision is taken, it is possible to envisage the collaboration of foreign industrialists. But the gesture is symbolic; the Government and the manufacturers desired, by themselves alone deciding to build, to affirm the French aeronautical industry's vocation as exporter.



Breguet 941 Prototype

Some of the more interesting features of this French STOL cargo/passenger transport are shown in these photographs from Roland de Narbonne

Top right, the inverted aerofoil section of the tailplane and the unusual incidence angle of the pitot head can be seen in this close-up which also shows the wool tufts being used for airflow tests.



Above, the main Messier landing gear has tandem wheels and low-pressure tyres. It retracts into fairings on the side of the fuselage.

Above, the 941 wing with everything down; slats at the leading edge, double-slotted 100°-deflection flaps at the trailing edge. The ailerons can also be drooped during take-off and landing.

Right, powered by four 1,250 s.h.p. Turboméca Turmo 3D shaft-turbines driving 13 ft. 8½ in. dia. Ratier Figeac fully reversible airscrews, the 941 has a maximum all-up weight of 45,200 lb. and a top speed of 280 m.p.h.

Future Plans for the X-15

WITH the North American X-15 breaking new frontiers in aerodynamics—one might say "aerospace dynamics"—the third X-15 conference held at Edwards Air Force Base, Calif., on Nov. 20-21, was taken as an opportunity to review and evaluate the progress which had been achieved in the flight research programme to date. There was also some interesting discussion on the use of the X-15 for purposes of space research, as a kind of recoverable sounding rocket with a pilot to monitor the operation of the scientific payload. A separate proposal to develop the B-52/X-15 combination as a recoverable *boost* system for the launching of small artificial satellites and space probes was fully discussed in THE AEROPLANE AND ASTRONAUTICS, Nov. 30, 1961, pp. 698-700.

The potential of the X-15 in the research fields of aerodynamics, structures, heating and space-medicine and further work to which the aircraft may contribute, have been summarized by Mr. Paul F. Bikle, director of the NASA Flight Research Center, and Lt.-Col. Edwin F. Pezda, X-15 Project Office, Wright Patterson A.F.B., Ohio. Their conclusions are reproduced below.

High-altitude Testing

The X-15 programme for the immediate future will be orientated towards continuing the research investigations into flight characteristics at high angles of attack, aerodynamic heating, reaction controls, adaptive control system performance and display and "energy management." Determination of the flight characteristics at high angles of attack, in the range from 15° to 25°, are required before attempting flights above the 250,000-ft. design altitude. Aerodynamic heating information has been of great interest in the programme to date, and a number of future flights will be directed towards this problem. Reaction control research data are just now becoming available from the flight programme; future flights at high altitude and low dynamic pressure should be of great interest in this connection.

An important feature of flights to come will be the incorporation of rate damping in the reaction control system. The flight behaviour with both the stability augmentation system and the reaction rate augmentation system will be compared to the flight behaviour with the adaptive control system. During these flights, data will also be obtained to define more completely the lift and drag characteristics of the X-15 configuration.

Work on display and "energy management" will be continued. In this particular case, the goal is to provide a working cockpit display for the use of the pilot in selecting his landing site.

A flight to the 250,000-ft. design altitude will be attempted as soon as a satisfactory modification to the windshield has been designed. The port-side double-pane windshield of the X-15 has cracked during two flights by Maj. Robert White—one following his record flight at 4,093 m.p.h. on Nov. 9. The cause has been traced to bolt stresses produced by differential cooling of the windshield and its metal frame, following aerodynamic heating on re-entry, and the remedy to provide expansion joints around the edges of the panels.

Altitude exploration flights above 250,000 ft. will be initiated after the installation of a back-up stability augmentation system, some time after March, 1962. Future altitude exploration flights are planned to acquire information between 200,000 and, possibly, 400,000 ft. at speeds from 2,000 to 5,500 ft./sec. Of major interest in this phase of the programme will be such piloting aspects as display, guidance, precision of control, and "bioastronautics."

Research Tasks

As these objectives are reached, follow-on programmes will explore, with new instrumentation, areas already partially investigated, such as display, boundary-layer noise, skin friction at high Reynolds numbers, and structural panel tests. A large number of space experiments have been proposed which make use of the X-15 as a test bed to obtain information at altitudes from 150,000 ft. to, possibly, 350,000 ft.—heights greater than those obtained by balloons but lower than artificial satellites. These experiments capitalize on the ability of the X-15 to provide "on-the-spot pilot input in the conduct of the experiment" and the return of the experiment to the ground for detailed evaluation and adjustment or correction of deficiencies if such occur.

Evaluation of the many proposals that have been made is now in process. Some of the experiments will be mounted in pick-a-back fashion. Others may be grouped together to share the cost of operation. Some require extensive modifications and are expensive in both time and money; for example, a stellar photographic experiment which would involve a stabilized platform extended through clam-shell doors from a modified instrument bay.

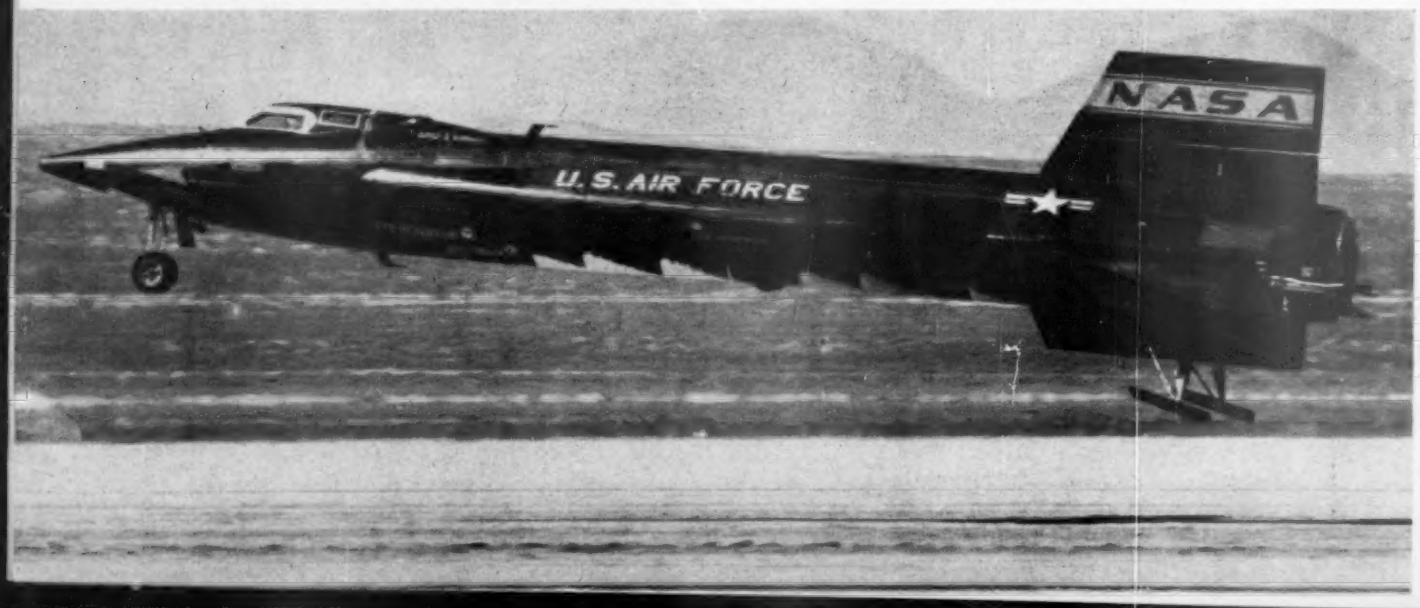
It appears that the completion of the present research programme will require about 30 flights in the next 18 to 24 months. The extent to which the addition of worth-while follow-on experiments will extend the value of the research aircraft is to be decided by the Research Airplane Committee, Admiral Hayward, Major General Demler, and Dr. Dryden representing the joint Navy-U.S.A.F.-NASA programme. A recommended follow-on programme is now being prepared for consideration by this Committee.

Here there is a point that needs to be made about the degree of reliance, or degree of certainty, in any future plans involved with the research programme. A future plan can only be as good as the estimate of what the problem areas are likely to be—both problem areas in the X-15 and problem areas in other programmes which may require information from the X-15. For example, when the X-15 was first approved, the objectives were clearly stated in terms of aerodynamic heating, speed, altitude, reaction control research, and bioastronautics.

As the first programme has progressed, one comes to the conclusion that, while these worth-while objectives have been,

(*Continued on page 767*)

Poised for touchdown above the dry lake of Edwards Air Force Base, Calif., the X-15 is shown to good advantage in this recent photograph.



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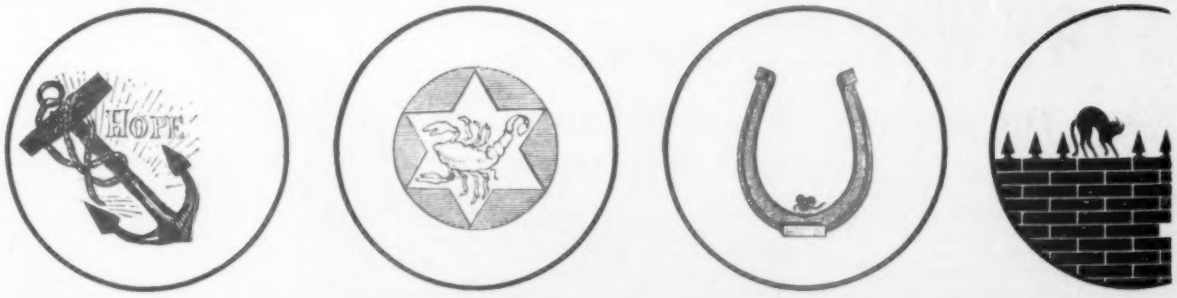

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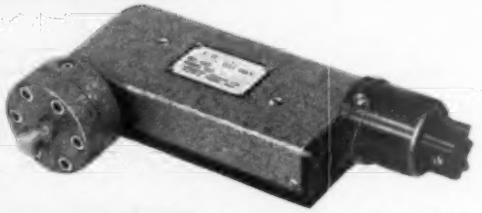

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This picture shows the "Q-ball" nose of the X-15. Developed by Northrop Corporation's Nortronics Division, the device senses angles of attack and side slip during exit and re-entry phases of hypersonic flight in the upper atmosphere. Its primary function is to indicate attitude angles which must be corrected to avoid limiting values of aerodynamic heating.

(*Continued from page 766*)

or will shortly be, achieved, many important benefits have been of a different sort. The X-15 programme has kept in proper perspective the rôle of the pilot in future programmes of this nature. It has pointed the way to simplified operational concepts which should provide a high degree of redundancy and increased chance of success in future space missions. And, perhaps most important, is the fact that all in industry and in the government who have had to face up to the problems of design, construction and making the overall system work, have gained experience of great value to the future aeronautical and space endeavours of the United States.

The same type of seemingly intangible consideration will influence future work with the X-15. The programme will be kept flexible and will be modified, extended or terminated on the basis of timely reviews by the Research Airplane Committee.

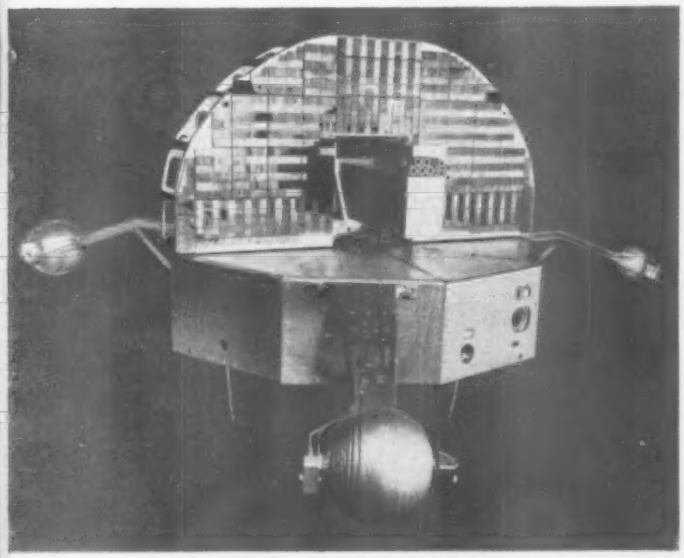
Although the authors of this summary do not specifically mention the fact, the use of the X-15 as a flying test-bed for systems to be applied in the U.S.A.F.'s Dyna-Soar orbital boost-glider must be another excellent reason for continuing, and expanding, the successful research programme which, in terms of the original objectives in aerodynamics, structures, heating and space-medicine is already regarded as 50% complete.

Progress with the OSO Satellite

FIRST of a new series of scientific satellites to supersede the Explorer range of vehicles is scheduled for launching from Cape Canaveral by the end of the year. This is the Orbiting Solar Observatory (OSO), which has been developed primarily as a stabilized platform for pointing scientific instruments with high accuracy. The intention with the initial vehicles—S-16 and S-17—is to investigate a broad spectral range of solar radiation. It is impossible to conduct these observations from the Earth because of the absorbing and distorting effects of the atmosphere.

Spin Stabilization

The satellite itself has been designed for maximum utilization of the payload space aboard the Thor-Delta launching vehicle. The wheel-shaped section, which forms the basis of the structure, has a diameter of 44 in., which is the maximum allowed by the Thor-Delta shroud. With the fan-shaped upper section, the satellite is about 37 in. high and weighs 441 lb.



Mock-up of the Orbiting Solar Observatory being developed by NASA for intensive study of the Sun. It will be launched into orbit between 300 and 500 miles to act as a stable platform for pointing instruments to examine and monitor electromagnetic solar radiation.

Like many other satellites, the OSO vehicle depends on the gyroscopic properties of a spinning body for its stability, although it has the added advantage of being able to control the orientation of its spin axis. This control is accomplished, in conjunction with solar sensors, by applying a torque to the spinning body to precess the gyroscopic action, the torque being applied by exhausting high-pressure nitrogen gas through small jet nozzles mounted near the top of the fan-shaped structure. Long-term pointing accuracy is expected to be better than two minutes of arc.

The top part of the satellite is a stabilized section mounted on the spinning wheel, and this fan-shaped array carries silicon solar cells. The two main structures are connected by an aluminium shaft which runs from the base of the instrument/solar-cell assembly through the centre of the wheel and terminates in the support-ring structure of the underside, being held in position by two bearings, one on the top of the wheel structure and one at the bottom.

Mounted on the shaft between the bearings is a high-pressure nitrogen gas tank which carries the gas supply for precession jets mounted on top of the solar cell structure. A torque motor, mounted on the base of the shaft, drives the shaft relative to the wheel. The torque motor actively controls the azimuth orientation of the stabilized section of the satellite by driving at an equal, but opposite, rate to that of the wheel. Mounted on the base of the shaft also is a slip-ring assembly, which allows power, telemetry signals and control signals to be transmitted from the stabilized section into the spinning wheel.

Three glass-fibre spheres containing pressurizing gas for the spin control system are mounted on arms extending from the wheel which, during the launching phase, are folded down around the third-stage motor. After payload separation, the nitrogen tanks are extended outward and the diameter of the satellite increased to 92 in.

Prior to third-stage firing, the third stage and attached

satellite are spun up to approximately 100 r.p.m. by small solid rockets. After third-stage burn-out, the arms supporting the three gas containers are extended, and the satellite is separated from the rocket carrier and the spin-rate of the wheel reduced to approximately 30 r.p.m. by jet action.

Thereafter, it is intended that this spin-rate shall be maintained within ±5% of nominal value by gas jets attached to each of the spherical gas containers which supply them. These jets are actuated by a signal from an electronic control system which computes the instantaneous period of rotation of the wheel with reference to the Sun. The three gas-spheres are interconnected to ensure that the rotating body does not become unbalanced due to unequal gas flow rate through the jets.

Instrumentation

The spinning section of the S-16 satellite is composed of nine wedge-shaped compartments, six of them being available for experiments which are not required to be continuously pointed at the Sun. The three remaining compartments are used to house some of the electronic controls, the batteries, and all the telemetry system, radio command system and the data-storage system.

Data required by the instruments are tape recorded for 90 minutes of the 95-minute orbit and transmitted to a ground station on a FM-FM system. During the five-minute period when the satellite is within range of a ground receiving station, the tape is played back at a speed which is 18.35 times the recording speed.

The telemetry system can be turned on by command from the ground station when the satellite is within range. It is also possible for command signals to turn on and off various portions of the experiments for conservation of power. The entire telemetry and data-storage system is duplicated and the standby circuitry can be switched on by ground command.

Operating Life

Useful lifetime of the first Orbiting Solar Observatory—the S-16—is expected to be about six months. The determining factor is the amount of nitrogen gas consumed in precessing the satellite during orbit. By incorporating design changes as a result of experience obtained with the initial vehicle, it is hoped to increase the operating lifetime of later OSO satellites to about one year. The succeeding vehicle—S-17—fits the same general description as the S-16, except that the pointable instruments in the fan-shaped upper section of the satellite will *scan* the Sun, and digital telemetry, not FM-FM, will be used.

Later, it is hoped to develop Orbiting Solar Observatories for launching by Atlas-Agena B. This will permit a considerable increase in the physical size and instrument capacity of the vehicles. There is also a possibility of modifying the observatory to permit even more precise pointing of the Sun-orientated instruments. Ball Brothers Research Corporation, who are prime contractors for OSO, believe that pointing accuracies of the order of 5 to 10 seconds of arc may be possible using the same basic system. Mechanical mock-ups have already been operated in the laboratory to an accuracy of about 6 seconds of arc.

Contract for Apollo

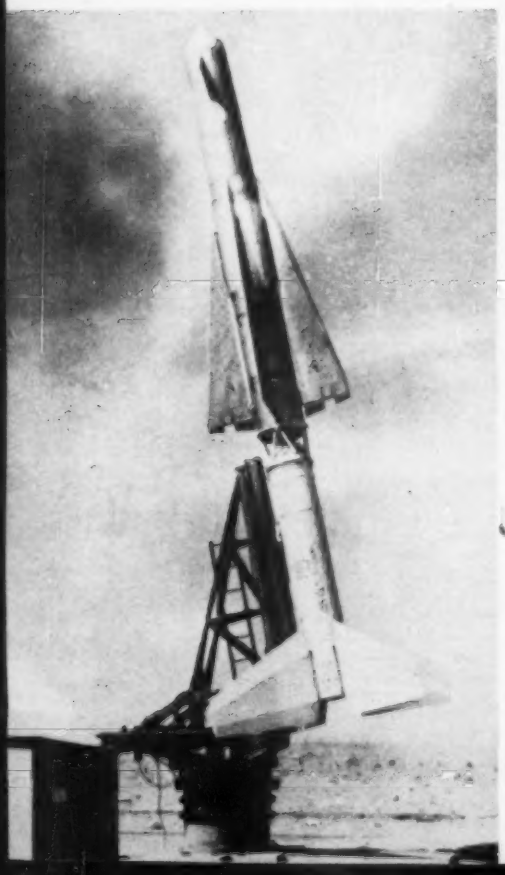
"NO single space project will be more exciting, or more impressive, or more important for the long-range exploration of space; none will be so difficult or expensive to accomplish." Thus spoke President Kennedy in a message to Congress last May concerning the project to build a three-man Apollo spacecraft leading toward eventual lunar landings and exploration of the Moon.

On Nov. 28, NASA announced that North American Aviation had been selected to design and build the spacecraft. As already reported (THE AEROPLANE AND ASTRONAUTICS, June 29, 1961, p.746) the Apollo project has three basic aims: (1) Earth orbital missions for testing spacecraft components and systems, space-crew training and development of operational techniques. (2) Circumlunar missions in which the spacecraft crew will perform many of the guidance and control tasks needed on the later lunar landing mission. (3) Manned landing and exploration of the Moon—the final goal of the Apollo project.

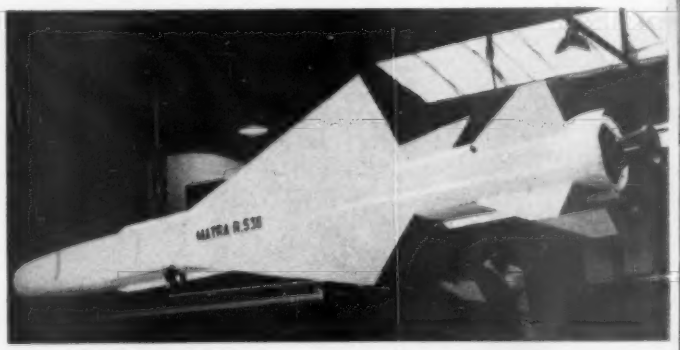
According to present schedules, Earth orbital flights will be possible in the 1964-65 period and circumlunar missions and manned exploration of the Moon before the end of the decade. Earth orbital flights will utilize as a launch vehicle the Saturn C-1. Circumlunar missions will make use of an advanced version of Saturn, while manned lunar landing missions will involve either the projected Nova vehicle or the advanced Saturn. In the latter case, NASA states, "spacecraft components would be joined in space through a rendezvous technique now under study." Use of Nova would permit launching of the entire spacecraft as one unit.

Design of the Apollo vehicle will be based on the "building block" or modular concept. One will be the "command centre" which will house the three-man crew. The second component will contain propellent, electrical power supplies and propulsion units needed for lunar take-off. The third component will contain decelerating rockets intended to lower the spacecraft onto the lunar surface.

North American will be responsible for two of these components—the command centre and the unit housing propellent, electrical supply and propulsion units; the company will be joined by a large team of sub-contractors. A separate contractor for the third Apollo spacecraft unit—the lunar landing system—is expected to be appointed within six months.



The Nord Vega ramjet test-vehicle designed to study combustion and aerodynamic heating problems during Mach 4-5 flights of several minutes duration. This example, powered by a version of the ST.600 Sirius ramjet, is seen with attached solid booster on a launching ramp at the French Hammaguir base in the Sahara. It reached an altitude of 70,540 ft.



Entering service early next year with the French Air Force is the Matra R.530. Powered by a two-stage solid propellent motor, the 12 ft. long AAM has a launch weight of 430 lb., and will be carried by the Vautour and Mirage interceptors. Guidance can be either semi-active radar or infra-red homing.

(*Continued from page 754*)

LUFTHANSA TO S.A.—A bilateral air agreement has been concluded between South Africa and West Germany. Lufthansa plans to start services in the near future.

BIGGER NEWARK.—The Port of New York Authority has announced plans for the further development of Newark Airport, New Jersey, one of New York's three main terminals. A new and bigger passenger building is to be constructed and the present building will become a hangar. The two existing runways are to be extended and a new 8,000-ft. runway laid down to the north of the present 4/22 instrument runway. Additions include a 120-acre cargo area and a 200-acre maintenance area.

WINDHOEK AIRPORT.—Development of the new airport to serve Windhoek (see our issue for Nov. 16, p. 653) has been approved and compulsory purchase of the necessary land has been made. To be ready for use early in 1964, the airport will have a 15,000-ft. runway.

T.W.A.'s NOVEMBER.—A 13.4% increase in international revenue passenger miles was recorded by T.W.A. in November, compared with the same month a year ago. Domestic revenue passenger miles were up by 7.6%.

U.A.A. IN N.Y.—United Arab Airlines has opened an office in New York, and has appointed Mr. M. A. H. Khalifa as regional manager for the U.S. No date has yet been announced for inauguration of the U.A.A. service across the Atlantic.

News About People

VISITING THE PATHFINDERS.—At her own request, H.M. Queen Elizabeth the Queen Mother visited the Pathfinder Club last Thursday. Here Gp. Capt. "Hamish" Mahaddie, president of the Association, presents Her Majesty with a Pathfinder Badge in the form of a brooch.

NOW WITH ULTRA.—Following his retirement from the Royal Navy, Cdr. E. W. Ridley has joined Ultra Electronics, Ltd., as a projects officer.

PRIZEWINNERS. — Among those who received awards from Sir Matthew Slattery, chairman of B.O.A.C., at the annual prize-giving of the College of Aeronautical and Automobile Engineering on Dec. 6 were: Mr. Neville Wright, now a B.O.A.C. flight engineer, the Olley Challenge Trophy; Mr. R. L. A. Cardozo, the Mollison Challenge Trophy; Mr. G. E. L. Koch, the Nelson Memorial Prize; and Mr. P. E. Wister, the Principal's Prize for aeronautical engineering. Mr. Wright also gained an honours aeronautical engineering diploma, the Aircraft Maintenance Engineer's A and C licences, passed parts 1 and 2 of the City and Guilds of London Institute Aircraft Maintenance examination and won their bronze medal for work in their 1960 examination.

GOLD MEDALLIST.—Capt. P. E. Bressey received the BALPA Gold Medal on Dec. 6 in recognition of his technical work for the Association and for IFALPA.

DYNAMICS RESIGNATIONS. — C. Rhoades MacBride has resigned as vice-president in charge of the Convair, Astronautics, Fort Worth and General Atomic divisions of General Dynamics Corp. R. C. Loomis, president of the Convair division, has also resigned to become president and chief executive of American Electronics, Inc.

JOINING BEAGLE.—On Feb. 1 next Wg. Cdr. T. A. Vigors becomes sales director of the Beagle Group. Until recently he was managing director of Vigors Aviation, Ltd., of Kidlington, who over the past two years have built up considerable business as Piper agents.

BLACKBURN ENGINES.—After 27 years' service with Blackburn Engines, Mr. J. J. Gadd, commercial sales manager, is retiring at the end of this month. His duties will be taken over by Mr. G. D. M. Wharton, who has been the company's Canadian representative.

MRS. WALTER BINAGHI. — We regret to record the death in Montreal on November 16 of Rosalie Binaghi, wife of the President of the Council of ICAO. Many people in this country will sympathize with Mr. Binaghi in his bereavement; he has been very closely connected with ICAO for the past 10 years.

PROF. H. B. SQUIRE.—With regret we record the death last month of Prof. H. B. Squire, Zaharoff Professor of Aviation and head of the Department of Aeronautics at the Imperial College of Science and Technology. He was 52.

Seventh S.A.A. Dinner

SINCE the Sopwith Apprentices Association was formed in 1916, it may well be the oldest of its kind in the aeronautical world. It is also likely to be unique for the fact that the chairman and the honorary secretary, as then elected, hold the same jobs today.

When the association was formed, 45 years ago, the chairman, Reggie Sutton, and the secretary, Victor Derrington, were apprentices. The object of the association was to get certain grievances dealt with.

It was successful at its first discussion with management. How successful its youthful founders could scarcely have foreseen. Today at its annual gatherings the chief figures are those who have established the Hawker-Siddeley group in its pre-eminent position.

Last Tuesday week (Dec. 5), at the Royal Aero Club, London, was a specially notable occasion in the series of S.A.A. annual dinners. A silver salver, inscribed with the signatures of the founders of the Sopwith Aviation Company, was presented by Sir Thomas Sopwith to Sir Frank Spriggs.

For the first time Sir Sidney Camm attended as guest and was persuaded to speak. He spoke of experience as a form of corrosion. And he had some words of encouragement for the rising generation.

Sir Frank Spriggs speaking at the S.A.A. dinner after being presented with a silver salver by Sir Thomas Sopwith (extreme left), Mr. R. W. Sutton between them. Sir Roy Dobson on extreme right.

British Executive Operators

7 Fitzpatrick and Son (Contractors), Ltd.

ENGINEERING contractors have a particular need for personnel mobility, and their requirements, where executive aircraft are concerned, more often than not call for a short-field performance for operation from building-site areas. Although not one of the larger civil engineering companies, Fitzpatrick and Son (Contractors), Ltd., are among the most progressive in using an aircraft as an aid to executive productivity and mobility, and in the Cessna 180 have a type which offers an excellent combination of short-field and cruising performance.

Since it is obviously sound policy to use established airfield facilities where available, the STOL-characteristics of the sturdy Cessna, which are gained with little detriment to a high cross-country speed, can be regarded as something of a bonus. But they were among the major features which governed the selection of the 180 when the company decided to take the plunge and operate its own modern aircraft after an experimental period with older types from 1957 onwards.

It was in 1955 that Mr. Pat Fitzpatrick, who is one of the two sons of the still-active founder and chairman of the company, Mr. J. M. F. Fitzpatrick, Snr., and is assistant managing director, learnt to fly at the Herts and Essex Aero Club. His interest owed a certain amount to the airfield reconstruction undertaken by Fitzpatrick and Son, including runway extension at such bases as Brize Norton, Coltishall, Honington, Wittering and Watton. It was obviously convenient to visit some of these by air, and after qualifying for his P.P.L., Pat Fitzpatrick flew himself, or went with his former instructor, Peter Ayles, to a number of the constructional sites.

The next step was the acquisition of its own aircraft by the company, in the plywood form of the well-tried Messenger, which established the principle of short take-off and landing characteristics, and performed good service until its retirement in mid-1960. With the Messenger, in November, 1959, came the employment of a company pilot—Len Richards—to relieve Pat Fitzpatrick of routine flying activities, although the assistant managing director maintains his piloting interests to the point of securing his multi-engined and RT ratings, and is obtaining a night rating on the Cessna 180. He is too busy to do as much flying as he would like, but pilots himself on Continental touring and other trips.

Mr. Patrick Fitzpatrick (left), who is assistant managing director of the family company, took delivery of the Cessna 180C from Airwork Services on Sept. 1, 1960. He flies the aircraft when not too busy, both in Britain and on the Continent.

Early in 1960, after it became possible to purchase new American aircraft, the four-seat Cessna 180 was selected as the most suitable replacement for the Messenger, which was supplemented until the arrival of its successor by the hire of a variety of other types. The 180C, G-ARAT, which was the first new example of its type on the British Register, arrived in August, 1960, and was almost immediately employed on the major project of that time. This was the Doncaster By-Pass Motorway, which was contracted to the Cubitts-Fitzpatrick-Shand consortium whereby Cubitts undertook the bridge construction, Fitzpatrick the roadwork, and Shand the earth-moving.

Main office of Fitzpatrick is in East London, and the road journey to Doncaster two or three times per week was tedious and time-consuming. With the Cessna based at Stapleford Tawney, near Epping, on the outskirts of London, about 25 min. was required to reach it from the office; flight time was 50 min. for the 140 miles, and the job was reached in another 5-10 min. from the disused airfield for which clearance for use had been obtained from the Doncaster Town Council. Elapsed time was, therefore, in the region of 1 hr. 20 min., compared with anything up to five hours by road.

Apart from executives and key personnel (the Cessna is available for use by most of the senior company employees), the 180 was used on the Doncaster job for the supply of urgently needed spare parts with an equally spectacular saving of time. Its popularity was soon confirmed by the company's 73-year-old chairman, who after some initial hesitance about its value, is now thoroughly air-minded. He uses the Cessna a great deal, map-reads on most flights, and says that if he were younger he would learn to fly.

Another valuable contribution to the company's activities made by the Cessna was its potential for aerial survey of constructional sites and projects. In the motorway construction, this potential was put to good use by the employment of

Aerial photography is one of the many tasks performed by the Cessna 180 of the Fitzpatrick company, which was jointly responsible for this section of the Doncaster by-pass.

The only one of its kind in Britain for some time, the red, white and black Cessna 180C, G-ARAT, of the Fitzpatrick company is a familiar sight on many airfields. It is fully protected internally against corrosion to reduce dependence on hangarage.

the Cessna for oblique photography, with hand-held cameras which resulted in some valuable references affording an immediate check on progress.

Although the Doncaster project has now been completed, the Cessna has another long-distance schedule, to an area near St. Breward, in Cornwall. This necessitates rather less frequent flights, at about one per month, on behalf of one of Fitzpatrick's associated companies connected with a granite quarry.

This isolated location presents something of an airfield problem, since the nearest operational landing ground is at St. Mawgan, some 40 min. away by car. The disused field of Davidstow Moor is still 20 min. from the quarry, so a 300-yd. field, roughly square in shape, was found alongside within two minutes' walk of the job.

Far from ideal in some respects, in that horses, sheep and cattle have prior claims, and one of the employees has to clear them while bringing out a portable windsock, the granite-surfaced field (through the courtesy of the local farmer) brings the Hantergantick quarry within less than two hours of the London office, instead of an all-day journey each way by surface means. Some of this Cornwall granite, as a matter of interest, is being used by the company for its contribution to the Hyde Park development scheme.

These short-field operations are possible in all but really instrument weather, and in that respect it is significant that, despite its lack of aids, Stapleford has only on one occasion not been reached on a return flight. The Cessna is normally flown off airways, maintaining VMC whenever possible, although it is comprehensively equipped with a selection of lightweight and low-cost nav/com equipment, including twin VHF (Narco Mk. V and Simplexer) and VOR and marker-beacon receivers. Motorola ADF has also recently been added.

As the Cessna is maintained on a private three-year C. of A. to the R.Ae.C. schedule, Class One radio is not necessary, and like the aircraft itself the present equipment has proved efficient and reliable. In slightly less than the first 12 months of its operation, the Cessna had flown some 300 hr., which compares very favourably with the utilization of larger executive aircraft flown by full-time pilots. Len Richards has a dual job within the Fitzpatrick organization as an assistant buyer, so that when he is not flying he's buying.

Utilization naturally goes down during the winter, as the Cessna is normally operated only within the short span of daylight hours, but this matches the tempo of outdoor activities for the company, which are equally affected by seasons and weather. The flying programme also varies with the company commitments, which at the moment are concentrated in the London area, on the Hyde Park reconstruction scheme and the Great West Road extension.

A new subsidiary company, however, Fitzpatrick and Nicholson, Ltd., which deals with housing and industrial building, is busy with estates at Chestfield, Kent, and Birchington. These sites are brought to within 20 minutes of Stapleford by the Cessna, using Manston as the terminal.

A rather longer-range commitment was recently added by the appointment of the company as sole U.K. agents for the road-laying machinery produced by ABG of Hamelin, Germany. This will necessitate liaison flights to the Continent, and trips for spares and so on, but with the 150 m.p.h. cruising speed of the Cessna 180, only about three hours' flying separates the two companies. Fitzpatrick also have quarry interests in Portugal, and the 180 has been to Lisbon, Malaga and Oporto on annual sorties.

In January this year, the trip was flown from Lisbon to Oporto in 1 hr. 10 min., which is about five minutes faster than the scheduled service by DC-6. By flying direct, a great deal of time can be saved, but for even more rapid transport the company are considering purchasing a light twin, perhaps in the Piper Aztec class, to replace the well-tried Cessna. The twin will have to possess only slightly less short- and rough-field capability than the Cessna, to utilize, apart from its other jobs, the company's own strip to be built at its new headquarters at Waltham Cross.

It will continue, otherwise, the present jobs of site survey, executive and spares transport to building areas and auction sales of plant all over the country, Continental liaison and the many tasks suggested by the versatility of a business aeroplane.

ACHIEVED ANNUAL OPERATING COSTS, CESSNA 180

Annual utilization	300 hr.
First cost of aircraft and equipment	£8,200
Depreciation over 5 yr. to zero	£1,640
Fuel, 10 gal. per hr. @ 5s. per gal.	£750
Oil	£10
Insurance, incl. passenger liability, etc.	£450
Hangarage	£120
C. of A. overhaul	£250
Maintenance and overhaul	£130
Crew pay, including expenses	£1,500
Landing charges	£30
Total annual costs	£4,880
Cost per flying hour	£16.25
Cost per aircraft mile, shillings	2.17
Cost per seat mile (4 seats), pence	6.5

Personal Flying

PERSONAL Plane Services, Ltd., the well-known White Waltham lightplane company, have been appointed U.K. agents for Hoffman propellers. These are available for the Emeraude, Jodel, Turbulent and other Continental types, and have a guarantee for 500 hours' flying.

PPS are also sole U.K. Service Agents for Scintex Aviation, and are able to supply and service all makes of Emeraude.

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A census of all aircraft movements over Britain is currently being completed by M.o.A., with particular reference to lightplane activities and non-scheduled operations. These have always been much of an unknown factor, since no records are available from A.T.C., but it is important that their extent be known fairly accurately if suitable allocations of air space are to be made to club, business and private operators.

For the first census of this kind, the present time of the year is probably the quietest for light-aeroplane pilots, and the true extent of movements may also be disguised by the fact that position reports are required only for one minute before and one minute after the hour, for every hour. The system employed is that every aircraft on the register with an active status has been allocated a card for each day of the week, and against the appropriate hour is a space for position, in co-ordinates or relative to an identification feature, and altitude.

The cards have been designed to be completed while in the air, so very little effort is required, and their information is confidential so far as other departments of the Ministry and A.T.C. are immediately concerned.

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Latest Mooney, the Mk. 21C, introduces further modifications to this now all-metal four-seater, of which more than 500 examples are expected to be produced during 1962. The 180 b.h.p. Lycoming O-360-A-1D engine is retained, but the original McCauley airscrew is being changed to a Hartzell constant-speed type. Improved flap effectiveness has been achieved by an increase in maximum extension from 21 to 33 degrees, which in turn has been made possible by a change from manual to hydraulic actuation.

The retractable undercarriage is still hand-operated, and a weight-saving programme using thinner-gauge skin for the tail surfaces and lighter mass balances has permitted a reduction in empty weight of about 35 lb. This enables up to 80 lb. of baggage to be carried in addition to four persons, full fuel (40 Imp. gal.), and normal radio. Rudder travel has been increased by five degrees for better control, particularly in cross-

RALLYING ROUND.—As we mention below, Morane-Saulnier Rallyes are now beginning to come off the production line at Tarbes, where a line-up of a half-dozen is seen before delivery.

wind conditions, while there have also been many internal modifications in panel layout and furnishings.

Mooney's fast Mk. 21, which cruises at 180 m.p.h. T.A.S. at 75% power, represents a considerable challenge to the more expensive products of the "Big Three" American lightplane manufacturers at its f.a.f. price of $16,450. U.K. distributors are R. K. Dundas Aero, Ltd., Dundas House, 59 St. James's St., London, W.1.

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After some delay through technical problems, the first production Rallyes are now leaving the Morane-Saulnier factory at Tarbes. On Oct. 26, 1961, the three-seat Rallye-Club, powered by the 100-b.h.p. Continental, was awarded its Type C. of A. (No. 13), and the 145-b.h.p. Super-Rallye is awaiting suitable weather conditions to complete its clearance.

By the end of October, 10 production aircraft had followed the four prototypes off the line and, by next January, a rate of 30 aircraft per month is planned. The first delivery was made to the Swiss Transair company at Neuchatel, which received M.S.880 No. 3, and all the first 10 are assigned to export. No. 8 is coming to Britain, where it will be demonstrated by the U.K. agents at the London Aeroplane Club, Panshanger.

Some orders were cancelled for the Rallye because of its production delays, but Morane-Saulnier reports that the overall total has been balanced by new contracts.

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Cessna's new twin-boom Skymaster, which should be available for sale during 1962 and promises to revolutionize the multi-engined lightplane market, is powered by two of the new Continental IO-360-A powerplants each developing 210 b.h.p. for take-off. They drive feathering and v.p. propellers in the pusher and tractor configuration, and the rear engine is cooled via lateral scoops just aft of the wing trailing-edge.

The six-cylinder units weigh 293 lb. and are interchangeable. In the prototype, throttle, pitch and mixture controls are the normal plunger type, mounted in pairs, to emphasize the difference in handling between conventional twins and the Skymaster, which is designed to eliminate problems of asymmetric power.

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● New aircraft are being added to the fleet of the Surrey and Kent Flying Club. Chipmunk G-APPK is completing an overhaul before joining its two stable-mates, and an Apache is being made available by its owner, Mr. R. Hawkins. It is being offered to members for twin conversion and touring at £14 15s. an hour dual and £12 15s. solo, which are very reasonable rates for this type of aircraft. A Hornet Moth has also undergone a complete rebuild, and has been fitted with VHF radio, and should be available after Christmas.

● The Southport Aero Club has completed more than 24 weeks' flying with its Aircoupe, and up to Nov. 14, had flown a total of 210 hr. Minimum target hours were 144, so that this total represents quite an achievement, particularly since the aircraft was not always available, due, among other things, to hitting a seagull, which necessitated a new wing (for the Aircoupe). Serviceability was otherwise very good. Club members have recently added a Beagle-Auster Terrier and a Cessna 172 to the fleet of privately-owned types.

Gliding Notes

by Dr. A. E. Slater

DERBYSHIRE AND LANCASHIRE Gliding Club's annual dinner at Buxton on Dec. 1 was followed next night by a special general meeting at Camphill to decide whether to develop an aero-towing site at the bottom of the hill. The owner of the club's ground on the top of the hill does not allow aero-towing there, and the only exception I know of was when Wolf Hirth towed off Hanna Reitsch from the field in 1937.

The proposed area is an L-shaped strip S.S.E. of Camphill. Its northern end, which is the top of the "L," is already used as an emergency landing ground by pilots who sink too low over the south slope, and is 1,000 yards from Camphill. So sailplanes can reach it easily from the top of a winch launch. They can, of course, also land back at Camphill after an aero-tow; consequently there will be no need for road transport either way.

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Of course a lot of stone walls will have to be removed, but the stones will be useful for filling in hollows to level up the ground. Both the N./S. and E./W. strips will be quite wide, so launching runs need not be confined to only two directions. The club invited Lorne Welch to give expert advice on the site, and he was satisfied with it.

Bernard Thomas, who put the case for acquiring the site for aero-towing, said that a circular had brought in 86 replies, of which 72 were in favour, 2 against, and the rest non-committal. As to getting the land, most of it belongs to a single farmer, Mr. Broom, who is about to retire and is willing to sell it, and a few fields needed to widen the E./W. strip can also be bought from another farmer.

"Gliding," said Bernard Thomas, "has reached the end of an era"; and, incidentally, during many years of that era he was secretary of the club—many a sluggard has been turned out of bed by him to the tune of the breakfast bell. In the new era, practically every major gliding club has aero-towing laid on; and now that the national championships can no longer accommodate everyone that wants to take part, those without aero-towing experience are likely to get left out.

Brian Jefferson then took over the task of persuasion, saying that the runways would be 840 yards N. to S. and 780 yards E. to W. There was still one more hurdle, the fact that the land is in a "national park" and planning permission is needed. However, the authorities have always been sympathetic to gliding, so it is hoped they understand that the scheme is for an extension of gliding, not an airport for Tideswell.

Stanley Armstrong dealt with the financial side; after selling the farmhouse and adjoining land not wanted for the airstrip, the net cost should be about £9,500, and most of this has already been guaranteed. The cost of running the site should add no more than 3% to the cost of running the whole club.

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One outstanding question remains to be answered. Hitherto no gliding club has made a success of attempting to run two separate sites at once. But this scheme should, everyone hopes, prove an exception; the airstrip is within gliding distance of Camphill, and, apart from a small hangar, there will be nothing resembling a clubhouse. Food, it was pointed out, will not be laid on (though I suspect that the duty pilot will bring sandwiches).

The proposal was put to the vote and carried unanimously, one of the two objectors having already said that Bernard Thomas' eloquence had converted him.

This year the Derbyshire and Lancashire Gliding Club laid on an excellent regional contest called "The Northern Gliding Competitions" during the first week of August. The landowner's family has never favoured big meetings during the shooting season, and consequently the similar event booked for 1962 is likely to be the last of its kind, as the airstrip will not accommodate enough tugs for a full-sized competition. However, Basil Meads assured us, the landowner has no intention of turning the club off its present site, so not to worry.

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HOLLAND now has two pilots with all three Diamonds added to their Gold "C" badge. The first was Willem Toutenhoofd, who qualified in 1957. The latest is Eddy van Bree, whose last Diamond was acquired for altitude in a wave at Innsbruck on Nov. 9 in a Ka-6 owned by Van Melzen, who was also in the party. Van Bree climbed from 1,050 to 6,130 metres, gaining 5,080 m., which is 16,666.667 ft. according to the conversion table. He made two other 5,000-m. climbs while there. His Goal Diamond was for 324 km. from Terlet to Albert (Belgium) in 1960, and Distance Diamond 502 km. from Terlet to Deauville this year.

Correspondence

The North Atlantic Decision

IN your article on "The North Atlantic Decision" on page 692 of the Nov. 30, issue, it is stated that B.O.A.C.'s order for three additional 707s was placed only a short time before the board's hearing of the North Atlantic application—and after Cunard Eagle's order for two 707s had been placed.

The position is that long before the A.T.L.B. hearing of the Cunard Eagle application to fly Atlantic services, B.O.A.C. had sought Government approval to buy three additional 707s to enable it to meet foreign competition on various of its international routes. The order was confirmed as soon as we obtained Government approval. This approval was given shortly before the A.T.L.B. hearing began.

F. C. GILLMAN.
Chief Press and Information Officer.
British Overseas Airways Corporation,
London, W.1.

Project Beacon—Some U.K. Solutions

WITH reference to the article on "Project Beacon" in THE AEROPLANE AND ASTRONAUTICS, Nov. 23, 1961, I should like to make the following comments.

The sectorized diagram of approach procedures (the "controller concept") with sectors for varying types of aircraft brings all aircraft, except high altitude turbojets, on to the ILS at four miles. The sectors would have to integrate for ILS much further out than that, and no scheme of "feed in" to the system is hinted at; this would seem to me the only basic problem for such a system.

In the long-term procedures CVR is mentioned as a new concept for aircraft unable to fly IFR to be given separation service and to maintain "altitude by reference to the ground," such CVR to be implemented within five years. We have been doing this for years, it is nothing but special VFR—which, incidentally, the year before last the M.o.A. ruled should not be offered to aircraft as a clearance, but might be requested by them.

Again in the long-term policy, special corridors for VFR in terminal areas, are due to be implemented within five years. These corridors are already a feature of both the London and the Manchester Zones, and have been so for many years.

The mixture of IFR/VFR is a problem here too, but the present British solution of compulsory IFR in Airways and in the London and Manchester Zones, which is being extended to most other controlled airspace, is not mentioned by the Americans. They must be aware of our practice; why are they not interested in it?

They prefer speed limits and segregation of IFR and VFR. We don't; again, why? The answers to these would be given willingly on application to the A.T.C.E.U. (A.T.C. Experimental Unit) at Southern Centre, who would also, but not so willingly, help to obtain official comment on British complementary practices.

"CONTROLLER."
London, W.1.

Collaborative Trends

MR. F. THOMAS (December 7) appears to have missed the main reason for the recent collaboration agreements between the British and other European aircraft manufacturers. This is, simply, that there will probably be only single requirements for some of the projects under consideration. No single firm will get a very large slice of the cake, but everyone will have something to eat. A number of the projects are of essentially European interest, anyway.

Curiously, we are still planning to compete *in global matters* on a European basis with a costly European satellite launcher programme. The French, on the other hand, are actively working on their own more modest satellite launcher programme to be operational at an earlier date, and from which they will acquire a fair amount of prestige.

We in Britain must soon accept that a realistic space programme involves collaboration with the United States by, at least, payment for large booster rockets such as Atlas and the use of existing launching facilities, combined with our own work on upper stages and spacecraft. In addition, we could, if we wished, develop a small, low cost, satellite launcher system as the French are doing.

The emergence of a realistic time scale for Blue Streak booster development, coupled with the long delays in arriving at a firm decision as to whether or not to proceed, have greatly diminished any value the project might be thought to have had, and a completely new appreciation at Government level is now urgently needed.

London, W.8. S. W. GREENWOOD.

Groundabout

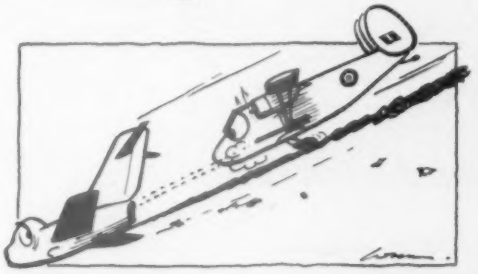
Now I haven't heard everything. During the evening of Exercise Sky Shield, when every civil aircraft in North America was grounded, the control tower at San Francisco International received a telephone call from a woman complaining of the lack of aircraft noise. The controller couldn't believe his ears and asked the lady to explain. It seems that she had come to accept the thunder of departing aircraft as part of life's pattern and, moreover, so had her baby. The silence, she said, was preventing the infant from getting to sleep and would he *please* send a few jets over soon? Well, of course the controller couldn't do anything to help but there does seem to be a market for an LP record of, say, a rhythmic take-off sequence, a sort of low-level lullaby, full of dulcet decibels.

*

Accolade. Well, helicopters have really arrived. From the pioneer days when they could just lift themselves and a pilot, through the days when they could also just lift passengers, to the triumphant announcement of New York Airways that as from soon, their new Boeing-Vertol 107s will lift themselves, pilots, passengers *and* stewardesses. On the short flights involved—longest 20 minutes—there will be no catering but the girls will be "well versed on what's doing in New York City"—(Thinks: "She was only a helicopter hostess but she knew where to go for a whirl").

*

From our Man in Cairo. "They call it a floor show because they can't get any lower."



Mac 2 Fighter. I used to think the Twin Pioneer was a pretty staid job, all Scottish and dour, but if Manchester is right, I was wrong. One of their dailies, reporting the TP's remarkable adaptability with the R.A.F. in the Middle East, says it has flown everything from coffee to coffins—and ice. Furthermore, it has a "built-in sting which enables it to be quickly adapted into a formidable fighter-bomber." Kassem and Nasser had better watch out.

*

Le Grand Tourisme. "Well, the regulations for flying from Nice to Corsica state that we must have a 119.7 m/cs. radio, one life-jacket per body, fluorescent dye, one Very pistol plus three cartridges, and a mirror, but there are no direct instructions. I suppose if the worst happens, we broadcast our prayers on the way down, then sit in our life-jackets surrounded by dye looking into the mirror until we get fed up and shoot ourselves."—*From the Tiger Club's "Tiger Rag."*

by Lorenz

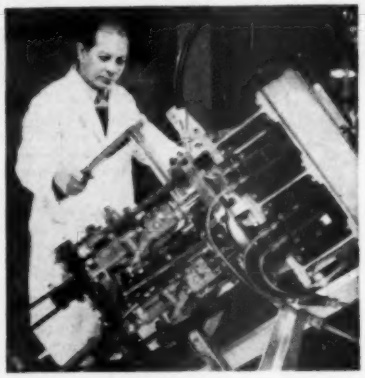
Industry Record

"Flight-testing" the Trident

When the D.H. Trident is airborne for the first time in the near future, the Fairey-designed hydraulic power control units which it embodies will already have undergone many hours of simulated flight. Specially designed test rigs in which the power control units are operated under typical flight loads are now engaged in this task at the hydraulics division of Fairey Engineering.

Whereas in older types of test rigs input signals were applied by cumbersome cams—to switch from one flight condition to another necessitated stopping the rig, changing the cam, and making various adjustments before resuming tests—the introduction by Fairey of an electro-hydraulic positioner has made possible a more satisfactory programming of operations.

This positioner is a compact assembly consisting of a hydraulic jack, a servo-valve, a torquemotor and velocity and position



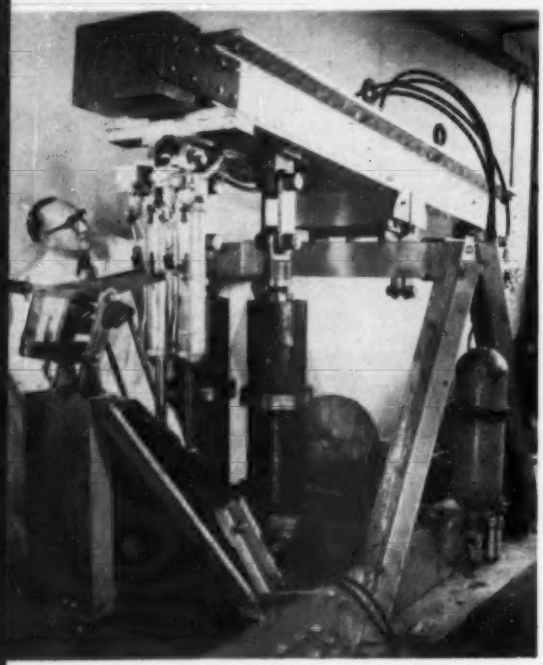
Hydraulic power controls for the rudder of the Trident undergoing simulated inertia and aerodynamic loading.

feed-back pick-offs. A small electrical signal applied to the torquemotor actuates the servo-valve which in turn causes the hydraulic jack to make a stroke. The length of this stroke is determined by the magnitude of the initiating signal. Sensitive response and accurate positioning of the jacks can be obtained.

Cams are still used to programme the control motions. These are of thin-gauge plate and are needed only to operate inductive pick-offs. Only one is controlling the positioner at any given moment. To change to a different set of flight conditions a master control cam is used to switch the control circuit to another pick-off driven by a differently shaped cam.

Thus a complete test programme can be set up on a number of cams, with a master cam switching control from one to another on a time, or number of operations, basis.

The control cams are contained in the base of a cabinet which houses the power packs and amplifier units. By adding cams and amplifiers, the cabinet becomes the control source for a number of test rigs which can be left running automatically.



Left, on the tailplane power controls test rig two pairs of spring-boxes are used for simulating aerodynamic loading. Each pair exerts a pull of some 2½ tons.

New Freight Loader

A new type of high-lift loading truck (illustrated above) has begun operations at Gatwick Airport, where Airborne Aviation Services (Gatwick), Ltd., are using it in conjunction with their victualling service as well as for general air freight transport.

The first of these vehicles is based on the 11-ft. 9-in. wheelbase of a standard 5-ton Commer forward-control chassis. Two more will begin work within three months. These will be 7-tonners having a carrying capacity equal to that of an Argosy.

The vehicle's light-alloy box body (by Palmer Coachbuilder, Ltd.) is mounted on a scissor-action sub-frame raised and lowered vertically by Edbro twin-ram hydraulic gear. Movement control is from inside the driving cab. Loading apertures are at front and rear and a rigid loading bridge, spanning the vehicle's cab, provides the necessary level platform between the front aperture and the aircraft freight access door.

Maximum body lift obtainable is 12 ft. 6 in. Height, with the full 5-ton load, is adjustable and can be held at any point up to the maximum.

Both the floor of the body and that of the loading bridge have reversible roller tracks. The vehicle now in use is soon to be converted to the Armstrong Whitworth Rollamat system and the two 7-tonners will have this facility from the outset. To reduce to a minimum the manhandling of heavy freight an Edbro 2-ton hydraulic loading gear is incorporated in the vehicle's tail gate.

E.E.A. Publications

Two new documents have recently been issued by the Electronic Engineering Association.

The first, Section One of the "E.E.A. Guide for Joints on Electronic Equipment" gives details of how to make wrapped and bound connections and their advantages, how to test them, and the tools necessary for the job.

Entitled "Pressure Transducers with Electrical Outputs," the second publication is a list of pressure transducers, giving operating characteristics and the name and address of the manufacturing company. Copies of these documents are available free of charge from the E.E.A. Technical Secretary, 11 Green Street, London, W.1.

Aviation Calendar

Dec. 14

Glasgow.—British Institution of Radio Engineers, Scottish Section lecture, "Jodrell Bank," by J. B. Wilson, at the Institute of Engineers and Shipbuilders, 39 Elmbank Crescent, at 19.00 hrs.

Dec. 15

London.—R.Ae.S. Man Powered Aircraft Group lecture, "Problems of a Man Powered Rotorcraft," by R. A. Graves, at 4 Hamilton Place, W.1, at 18.00 hrs.

Dec. 16

London.—Science Museum lecture, "The Story of Flight," by V. Wall, at the Science Museum, S.W.7, at 15.15 hrs.

Dec. 19

London. — Photogrammetric Society lecture, "Adjustment of Aerial Triangulation by Electronic Digital Computers," by D. W. Proctor and F. Amer, at the Geological Society, Burlington House, Piccadilly, W.1, at 18.30 hrs.

London Airport.—Institute of Transport, West Middlesex Group lecture, "Practical Aspects of Operating Jet Aircraft," by Capt. J. B. Linton, in the Conference Room, at 18.00 hrs.

Dec. 21

Grangemouth.—Society of Instrument Technology, Grangemouth Section lecture, "Instrumentation of Space Vehicles," by Dr. A. E. Roy.

Company Notices

NEW COMPANIES

Airgeneers, Ltd. (707,882).—Private co. Reg. Nov. 13. Cap. £2,000 in £1 shs. To acquire the business of designing, developing, manufacturing and maintaining aircraft and aircraft components carried on by Leslie J. Badger at Staverton Aerodrome, Glos. Directors: Leslie J. Badger (permanent) and Mrs. Leah E. Badger, both of 100 Gloucester Road, Cheltenham. Sec.: Leah E. Badger. Reg. off.: Staverton Aerodrome, Cheltenham.

Inter-Continental Air Caterers (Gatwick), Ltd. (708,980).—Private co. Reg. Nov. 24. Cap. £100 in £1 shs. To carry on the business of airline caterers and purveyors. Directors: Horace W. Leake, Hope Cottage, Harlington High Street, Harlington, Middx; Arthur Cottrell, Orchard End, Farm, Hazlemere, Bucks; Alan C. Lusty, Ranworth, Charlwood Road, Horley, Surrey. Sec.: H. W. Leake, Reg. off.: Calypso Works, Charlwood Road, Horley, Sussex.

CHANGES OF NAME

Field Aircraft Ancillaries, Ltd. (600,618), Aeronautical engineers and contractors, etc., 72 Wigmore Street, W.1.—Name changed to Fieldtech, Ltd., on Aug. 31, 1961.

Great Western and Southern Air Lines, Ltd. (346,951), Bealine House, Ruislip.—Name changed to Anglo Overseas Properties, Ltd., on Aug. 29, 1961.

RECEIVERSHIP (APPOINTMENT)

Air Safaris, Ltd. (643,059), Grand Buildings, Trafalgar Square, W.C.2.—Richard E. Coates, of 245 Oxford Street, W.1, was appointed receiver and manager on Nov. 8, 1961, under powers contained in debenture dated Jan. 20, 1961.

Personal Notices

BIRTHS

Chandler.—On Nov. 27, at Zachary Merton Maternity Hospital, Rustington, to Angelia (*née* Bole), wife of Flt. Lt. J. A. W. Chandler—a son.

Howes.—On Dec. 2, at R.A.F. Hospital, Akrotiri, Cyprus, to Rita (*née* Crawley), wife of Flt. Lt. P. Howes—a son.

Moulden.—On Nov. 23, at R.A.F. Hospital, Changi, Singapore, to Terry (*née* Hoskins), wife of Flt. Lt. K. Moulden—a son.

Munro.—On Nov. 28, at Whitnash, Leamington Spa, to Mary, wife of Flt. Lt. D. G. Munro—a daughter.

Warrington.—On Nov. 29, to Zubeida (*née* Saleh), wife of Flt. Lt. V. L. Warrington—a daughter.

Williams.—On Nov. 26, at R.A.F. Hospital, Wroughton, to Renee (*née* Duval), wife of Sqn. Ldr. W. J. Williams—a son.

DEATHS

Moore.—On Nov. 29, at Parkstone, Dorset, Wg. Cdr. B. Fitzgerald Moore, O.B.E., R.A.F. (retd.).

Robertson.—On Dec. 3, in Edinburgh, B.K.D. Robertson, A.F.C., R.A.F. (retd.).

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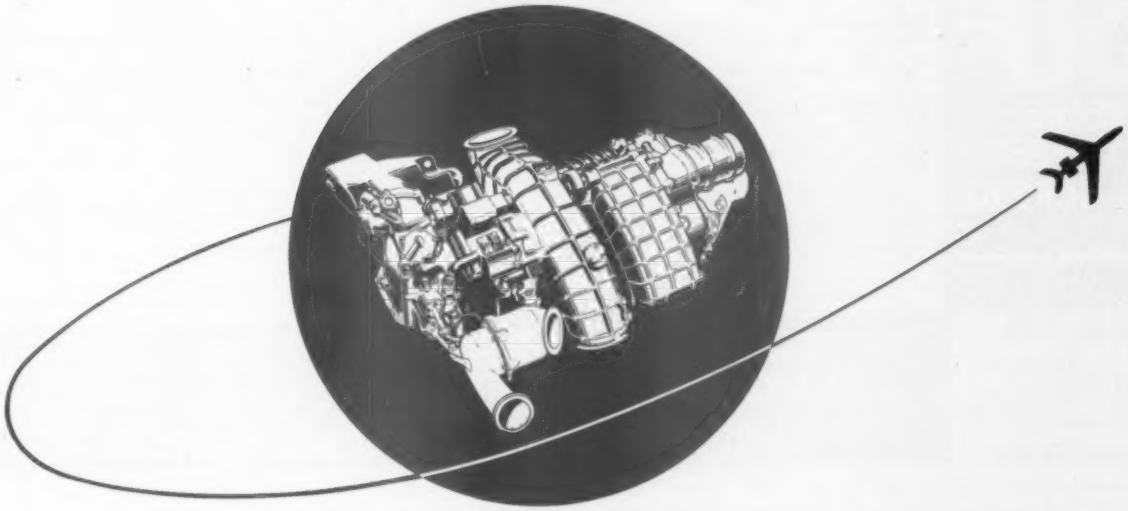
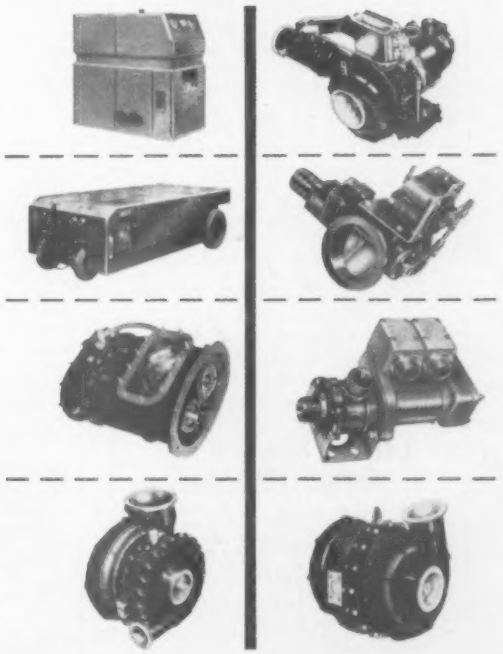
Designers and manufacturers of cabin compressors, flow control systems, air cycle and vapour cycle cooling equipment, water extractors, valves, turbo alternators, air conditioning and pressure testing trolleys, static cooling units.





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THE PROPRIETORS retain the right to refuse or withdraw advertisements at their discretion and are not responsible for clerical or printers' errors, although every care is taken to avoid mistakes.

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BRANCH OFFICES: Bayliss House, Hurst Street, Birmingham, 5. Telephone: Midland 6616. 50 Hertford Street, Coventry. Telephone: Coventry 27414. 1 Brazennose Street, Manchester. Telephone: Deansgate 6114–8. 12 Renfield Street, Glasgow. Telephone: Glasgow Central 1413.

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PRINCE. Executive. Airline radio, de-icing, L/B tanks. **£20,000.**

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AUSTER Autocar J5P, Gipsy Major 10 engine, 603 hours total, Plessey 6 ch. V.H.F., generator, electric starter, dual and towing mod. This excellent 1956 4-seater, works maintained by the Gloster Aircraft Co., C. of A. to May, 1962, is a prize at £2,000.

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FOR sale. PBY5A, converted to 285 ACF Cat., seating 10 passengers and three crew, wide cargo doors, dash 94 mod. P. and W. engines, large list of spares. Box A113, care of THE AEROPLANE AND ASTRONAUTICS. 617-8

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SPECIAL NOTICE

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Classified Advertisements for the issue dated DECEMBER 28 must reach us not later than first post WEDNESDAY, DECEMBER 20.

Telephone instructions can be accepted up to noon.

All instructions should be addressed to The Manager, Classified Advertisement Department,

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TERminus 3636

Please post your advertisements early.

Aircraft Wanted

AUSTER 3-4-seater required, preferable Mark 5, must be fitted with starter, dynamo, VHF radio, in good condition, particulars to A. J. Penzer, CFI, Warwickshire Aero Club, Birmingham Airport. Phone, Victoria 2656. 697-x9149

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Name	Page
A	
Air Couriers, Ltd.	16
Air Registration Board	17
Automotive Products, Co., Ltd.	18
B	
Boeing, Co., The	Inside Front Cover
Boulton Paul Aircraft, Ltd.	4
British Aircraft Corporation, Ltd.	Front Cover, 8, 9
British European Airways	16, 17
C	
Cunard Eagle Airways, Ltd.	15
D	
Decca Radar, Ltd.	Inside Back Cover
E	
Elliott Bros. (London), Ltd.	2, 3
G	
Godfrey, Sir George, & Partners, Ltd.	13
Graviner Manufacturing Co., Ltd.	12
H	
High Duty Alloys, Ltd	1
K	
Keegan Aviation, Ltd.	15
L	
Lucas Gas Turbine Equipment, Ltd.	Back Cover
M	
Microcell, Ltd.	11
Ministry of Aviation	14
P	
Pye-Ling, Ltd.	7
R	
Rollason Aircraft & Engines, Ltd.	14
S	
Sampson, Low, Marston & Co., Ltd.	17
Sangamo Weston, Ltd.	12
Shackleton Aviation, Ltd.	14
Southend Municipal Flying School	15
Sperry Gyroscope Co. Ltd., The	6
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U	
United Aircraft International	5
V	
Vigors Aviation, Ltd.	14
W	
Walter, A. J., Ltd.	15

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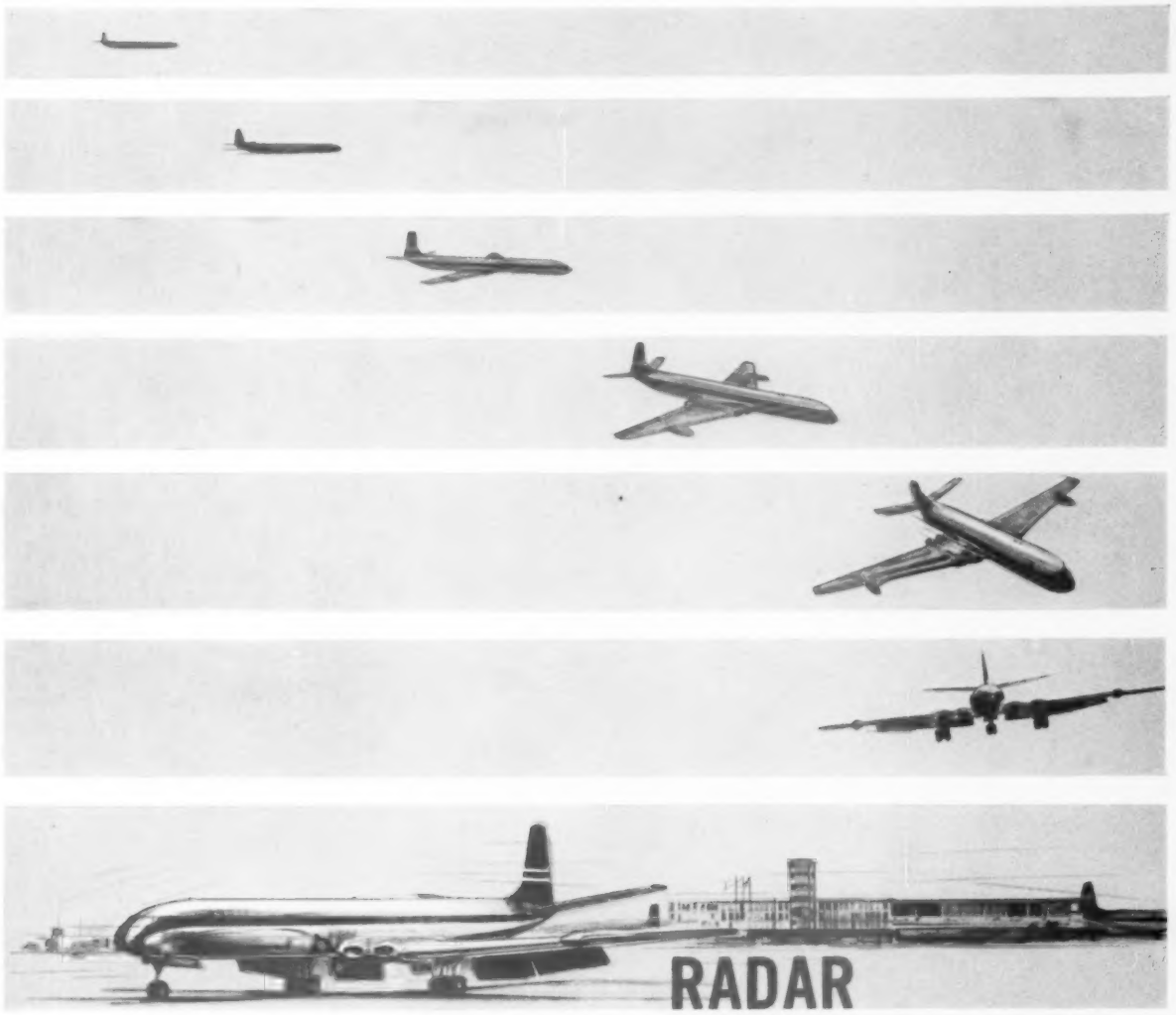

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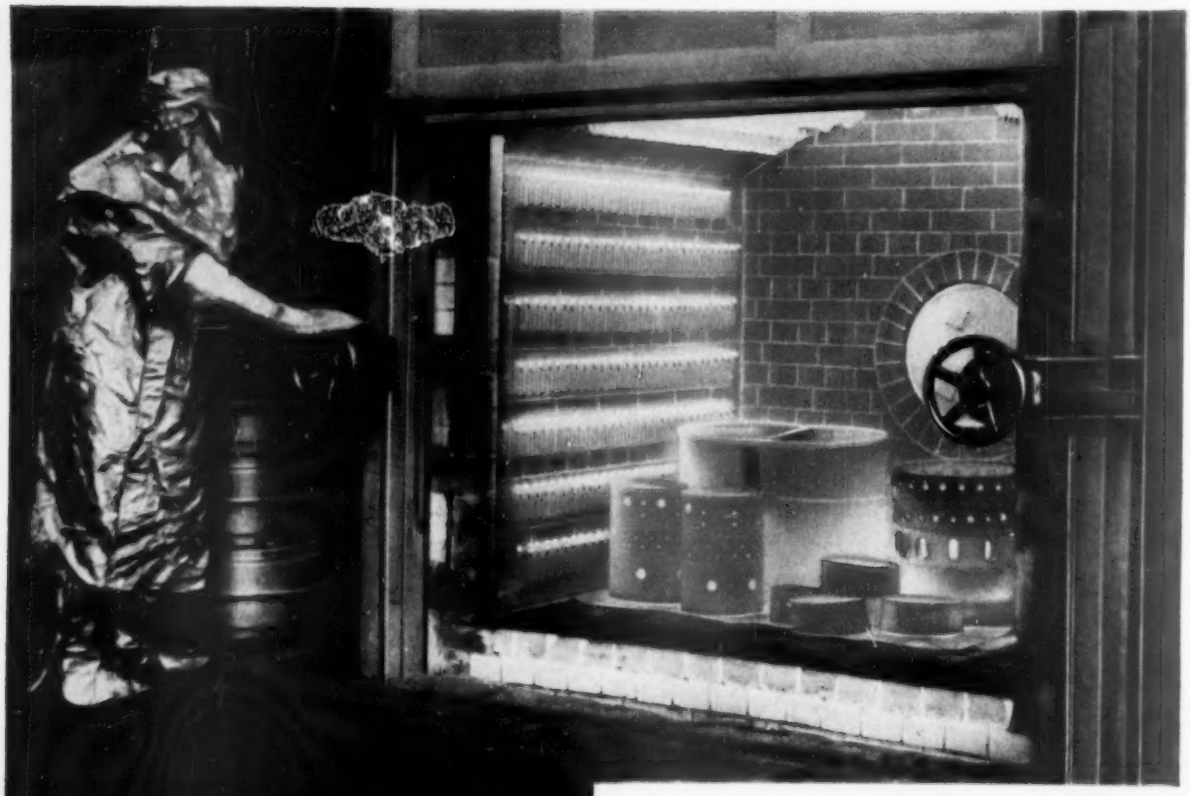

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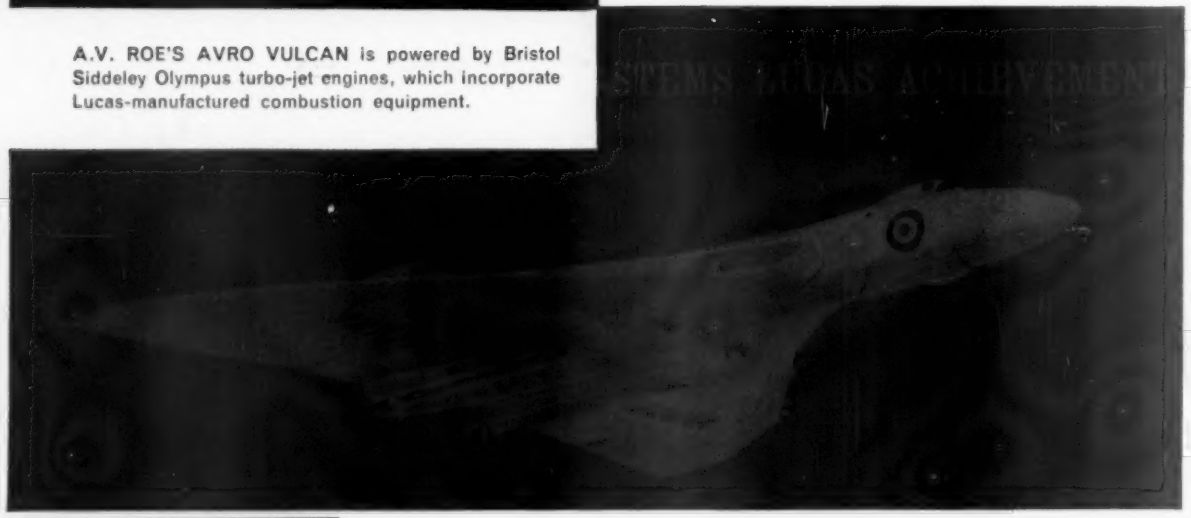

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